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VOL. XI. NOVEMBER 18, 1882. No. CCLX.

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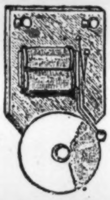

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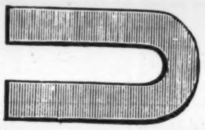
MAGNET  **STEEL,**

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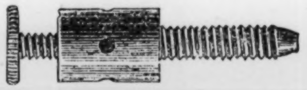

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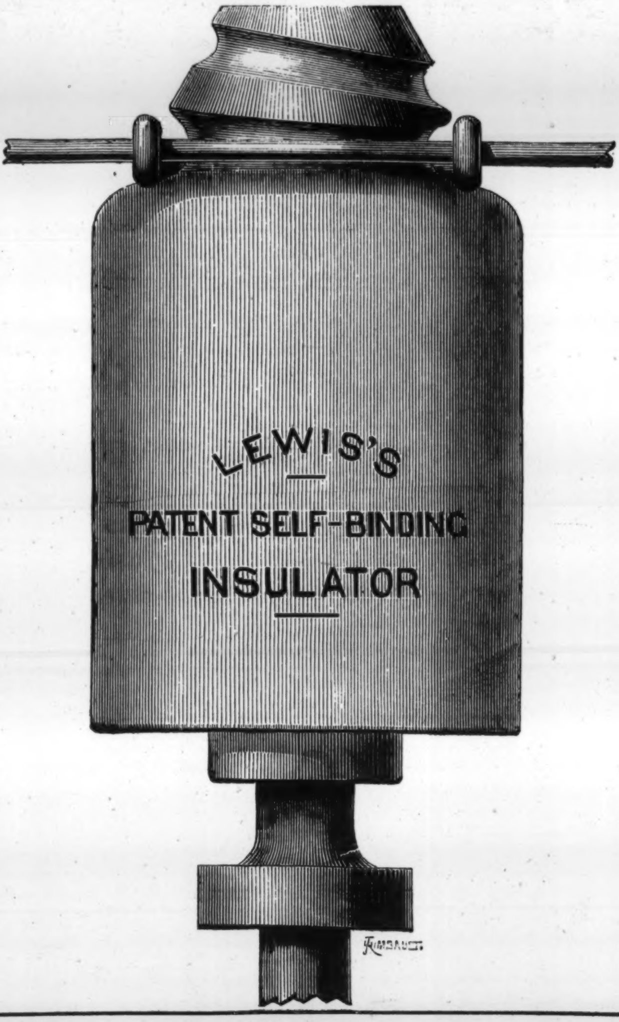

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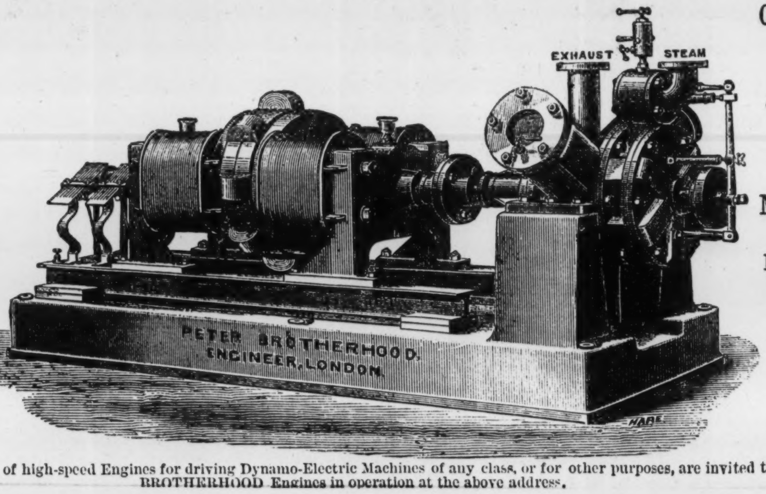

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THE TELEGRAPHIC JOURNAL AND

Electrical Review.

VOL. XI.—No. 260.

THE ELECTRIC LIGHT COMPANIES.

AT the present moment the prospects of lighting by means of electricity do not look particularly inviting at the first glance, for the action which has been taken by shareholders in some of the subsidiary Brush electric light companies appears to have caused a slight reaction, or at any rate a temporary lull in the progress of the "light of the future." This, however, is unwarranted, and we think that the time has now arrived for the public to be guided more by the utterances of those journals devoted to the subject of electrical science, rather than by their own judgment, or the unstudied descriptions of the various competing systems appealing to the public purse, which appear in the daily press. On Saturday last three petitions were down for hearing before Mr. Justice Chitty, for winding-up respectively the "Birmingham and Warwickshire Brush Electric Light and Power Company," the "Brush Midland Electric Light and Power Company," and the "Devon and Cornwall Electric Light and Power Company."

Why is it that these companies have not got to work? Was it that they could not contract to give the electric light at the same price as gas, light for light; had they not the apparatus wherewith to supply the public demands; is it that the action of local authorities in the districts over which these companies held control damaged their interests; or is the public in the above-mentioned localities averse to trying the electric light? We cannot believe the latter to be true, nor *should* the question of price be the cause, for did not the Anglo-American Brush Electric Light Corporation illuminate for one year part of our City for less than had previously been paid for gas, and did they not contract for another year at a price but slightly in excess of it?

We must look, therefore, to some other cause to explain the motive of certain shareholders in these subsidiary Brush companies, and consider whether the uncertainty existing with respect to the Lane-Fox patents has *really* much to do with their resolve? One can quite understand that such an uncertainty would be gladly seized upon as an excuse for an endeavour to make the parent company disgorge the concession money obtained from its numerous offspring. Whatever may be the cause, we do not see that any harm will ensue should some of the subsidiary companies cease to exist. In fact it is to be looked upon more as a matter of congratulation, as it had evidently been attempted to extend the Brush system beyond the demands for it; and when this system has found its fair level, and a few straggling companies, promoted for working other methods of little or no use, have followed in the wake of these subsidiaries, then we shall find considerable improvement in the prospects of those which are left.

It is difficult to see that any advantage is to be gained by attacking the parent company. Concessions were obtained by the directors of the "offshoot" companies presumably with their eyes open, and the shareholders also have only themselves to blame if they find they are losers over the late excitement in electric lighting matters. We would warn intending investors in electric light companies not to be again led away by any extravagant assertions of the daily press, or by the circulars of interested stockbrokers, but to be guided by the opinions of those competent to decide as to the merits or defects in any electric lighting system. The present nervous feeling existing as to the future of the electric light is not warranted, and the clearing away of the *fungi* of electric light companies will leave room for the healthy plants to thrive and increase.

INCANDESCENCE AND ARC LAMPS ON THE SAME CIRCUIT.

A SHORT article in our last issue, sent to us by a correspondent, showed some of the disadvantages of combining the two systems of electric lighting on the same circuit. It was mentioned that one of the drawbacks was the fluctuation of the candle-power of the incandescence lamps with the change of resistance in the "arc." It is evident that arc lamps in which the carbons are arranged one above the other must all in a greater or less degree partake of this variation. There must be many instances in which such a combined system would be advantageous could the faults mentioned by our correspondent be avoided.

It would be interesting to know if the writer of the article referred to had ever tried arc lamps other than those of the above-mentioned type. The Rapieff arc lamp and the Jablochkoff candle should give very good results in conjunction with incandescence lamps, as in both the length of the arc is practically invariable, and therefore variation of resistance should be less noticeable than when the carbons are arranged point to point. The "Sun" lamp, of which the Rapieff system was the forerunner should also give equally good results. These systems therefore, at the moment, appear to be the best adapted for a combined method of working arc and incandescence lamps. The matter of arranging the circuits as described by our correspondent appears to us to present the greatest difficulty, and although, as before said, there are probably many places in which the combination is desirable, it does not seem at present that the two can be used together very harmoniously; it is wisest, therefore, to work each system independently of the other, and not risk a failure at a time when it is of paramount importance that all installations of the electric light should be pronounced successful.

THE COST OF THE ELECTRIC LIGHT.—We read that in the York railway station, which for upwards of twelve months has been illuminated by means of the electric light, the use of gas has been resumed. It is said that the great extra cost of the electric light, as compared with gas, has induced the directors to make the change. We also notice that the town of Gainsborough (Lincoln) invited tenders for the supply of the necessary lighting for one year, with the following result:—Brush Midland Electric Light Company, £700, the Gainsborough Gas Company, £470, which was accepted.

DANGER FROM EXPOSED ELECTRIC LIGHT WIRES.

The recent death of a workman in America, who came to an untimely end by receiving the current from a large Brush machine, has been the cause of many sensational paragraphs and absurd statements in the daily press. We have alluded over and over again to the danger to human life involved in the manipulation of the Brush system, or indeed of any other system in which a large number of arc lamps in series are employed on a single circuit; and we have also touched upon the matter of fire risks attached to electric lighting, concluding that absolute safety from fire may be secured if proper precautions are taken. Whatever danger there may be from fire, injury, or death, attached to the use of the electric light, is now in a fair way of being grossly misrepresented. We learn that Mr. Edison is said to have confided to the reporter of a New York paper his opinion that such accidents would continue to increase with the multiplication of wires carrying powerful currents, till some dreadful accident occurred to arouse public indignation and compel the placing of all such wires underground. In case of fire particularly, the breaking of a great number of wires, which would be thrown down in inextricable confusion by the fall of a roof, might have serious results. Another gentleman, Mr. Park Benjamin, a well-known scientific man, has called attention in New York to the fact that a stream of water from a hose-nozzle, striking a broken arc-light wire, might easily serve to conduct the current through the body of the fireman who held the hose, with fatal consequences; while the cutting of such a wire with an axe, particularly if the handle of the axe were wet, might have a like effect.

The latest contribution towards giving the general public an idea of the horrors to be anticipated in the employment of electricity appeared in the columns of the *Times* of the 13th inst., under the signature of "A. I. C. E." This writer says:—"It is no secret that more than one theatrical manager has in contemplation, or has already decided, to employ the electric light in the coming Christmas pantomimes or extravaganzas as a personal ornament for their hobgoblins and fairies. This can only be done by means of some form of accumulator carried by, or attached to, the individual, and whether the star light is to form an ornament for the head, or to glisten at the end of a wand, the constant danger is patent. There is no need to be an electrician to understand this. A grave responsibility will be incurred by those managers who permit it—a still graver one by those who force it on their *employés*."

Returning to Mr. Edison and the breakage of a number of wires, we should imagine that such a casualty would have the effect of stopping the electric current altogether, and persons in charge of dynamo-electric machines would immediately know what to do. Mr. Park Benjamin cannot seriously mean that a stream of water striking *broken* arc-light wires could effect the serious results he anticipates. If the broken wires were sticking up in the air all the current produced by the machine would have vanished with the broken circuit, and a water column from a hose-nozzle would not be the means of reproducing it. If the wires were in connection with the earth then it is hardly to be expected that the current would prefer to travel along a water column. From the tone of A. I. C. E. one would imagine that the theatrical managers had taken him into their confidence, so exactly does he presume to know how their ideas are to be carried out. It would be an interesting sight to see the fairies and hobgoblins in a pantomime dancing about with accumulators attached to, or carried by, them, each cell weighing 60 or 80 lbs. Seriously speaking no one can pretend to say that the danger to persons or edifices is not far greater in the case of gas than with the electric current. Mr. Edison of course naturally prefers a low tension current, as his system is based upon it; Mr. Park Benjamin draws upon his imagination for something which will never occur in reality, and A. I. C. E. has doubtless his reasons for writing as he does concerning the electric light, but those reasons are not the result of experience. That there is danger attached to the employment of electricity we admit and have always given it due prominence, but we cannot allow that the danger in almost every case is not sufficiently met if ordinary caution is used.

THE WINDING-UP OF ELECTRIC LIGHT COMPANIES.

Before Mr. Justice Chitty's Court, Roll's Yard, three petitions were on Saturday last on the list for presentation in regard to the winding-up of the following Electric Light and Power Companies:—

The Brush Midland Electric Light and Power Company, on petition of R. J. Wigram;

The Birmingham and Warwickshire Brush Electric Light and Power Company, on petition of A. C. Sprange; and

The Devon and Cornwall Brush Electric Light and Power Company, on petition of H. Whorlow.

All three being opposed petitions were, on their being called, adjourned for a fortnight.

In the case of the Devon and Cornwall Electric Light Company, Mr. Waller said that this was a case in which the petition was really doing harm. It was a very large company, and its business was being seriously interfered with by the fact of the petition having been presented. He would ask that the petition should come on for hearing at a very early period—less than a fortnight. They wanted, too, their affidavits as soon as possible. The other side had, in fact, written to them that they should not hurry themselves with their evidence. If that were so, the case could not come on for some weeks.

Mr. Justice Chitty said that he could not allow the petition put down on the list an undue proportion of the time of the Court.

Mr. Waller read the letter alluded to:

> Dear Sirs,—You shall have copies of the affidavits directly they are ready. Some will be sworn to-day or to-morrow. As the petition will be opposed, you are aware that it cannot be reached for some time. I shall be obliged if you will let me inspect the minute-book.

Mr. Justice Chitty said it was simply the statutory affidavits they wanted.

Mr. Waller said that it was, and he further considered that the procedure on the other side was demurrable.

Mr. Justice Chitty asked whether they were going to stake their case on the demurrer?

Mr. Waller said he should like to consider that.

Mr. Whitehorne, for the petitioner, objected to the proposal, but he would meet the company by suggesting Friday.

Mr. Waller said that gave them no time to answer it.

On the suggestion of Mr. Justice Chitty it was ultimately decided that copies of their affidavits should be handed to the defendants by midday on Thursday, the 16th, and on this understanding the petition stood adjourned.

VISION BY THE LIGHT OF THE ELECTRIC SPARK.

By W. LECONTE STEVENS.*

(Read before the American Association for the Advancement of Science.)

In previous papers the phenomena of optic divergence have been discussed, and also various peculiarities of vision under controllable physiological conditions. Among them was stereoscopy from a pair of perfectly similar figures, produced by so varying these in relative position that the retinal images of them were dissimilar. A geometric explanation of this was given, in which it was assumed that freedom of motion was allowed the eyes; but with the reservation that such motion is not necessary in obtaining the perception of binocular relief from stereographs constructed in the ordinary way, and that it was probably necessary only to the completeness of the perception in the present case when the dissimilarity of retinal images was very considerable.

In continuing this investigation the electric spark has been employed as a means of illuminating the pair of pictures. These were viewed with the aid of a reflecting stereoscope, already described as a device to indicate the value of the optic angle, positive or negative, that results from any possible relation between the visual lines of a pair of eyes. Vision may thus be made normal or abnormal at will. The use of the spark in the study of binocular vision is no novelty; but it seems not to have been employed hitherto in studying abnormal vision with the visual lines divergent, or the peculiar mode of stereoscopy recently devised.

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* An abstract of this interesting paper was given in our Notes columns, September 9th.

The apparatus employed was a large induction coil, belonging to the physical cabinet of Columbia College, the use of which was kindly granted by Professor O. N. Rood. In the secondary circuit a Leyden jar was interposed, and by means of a pair of lenses the light was separately converged upon each of the pair of pictures, strongly illuminating them momentarily in the dark room. Each picture was kept upon the pivoted arm of the stereoscope at a fixed distance from the oblique mirror that reflected its light into the eye of the observer. The sum of the incident and reflected rays from each to the receiving eye was, as nearly as possible, 25 centimetres.

The stereograph first employed was one of the moon, the same one formerly used with this instrument in vision by continuous light. By varying the arrangement of the cards the visual effect of binocular combination of images could be made that of either a convex surface, or concave surface, or an indistinct but flat surface. The observer placed himself with closed eyes in proper position before the stereoscope while the manipulator of the apparatus arranged the cards. He was then requested to interpret the combined retinal image produced by illuminating the cards with a single spark, not knowing previously whether to expect convexity, concavity, or flatness in the combined picture, and the interval of illumination being too brief for any possible play of the eyes.

In conducting these experiments I was so fortunate as to secure the co-operation of Mr. W. W. Share, Assistant Professor of Physics in Columbia College, who soon acquired more than usual skill in the control of his eyes. Each of us acted successively as observer and as manipulator of the apparatus, the work being distributed through a number of days for the purpose of avoiding fatigue at any one sitting. When the relation between the visual lines was such as to imply no unusual muscular strain, each of us found it possible to interpret the binocular retinal image correctly by the light of a single spark. Many other stereographs were substituted in succession for that of the moon, and with similar results. Some of these consisted of heavy black lines on a white ground, others of white lines on a black ground; in some cases one picture belonged to one of these classes and its mate to the other. At the suggestion of Professor Rood a pair were constructed, one of which consisted of green lines on a red ground, the other of red lines on a green ground. In this case of complementary colours it was a little more difficult to attain a perfectly clear perception by a single spark, but when there was any uncertainty another spark, after an interval of a second of time, was usually sufficient to resolve the doubt. These pictures were arranged to give stereoscopic relief, but the nature of this, whether direct or inverse, was what the observer had to determine.

Upon each arm of the stereoscope was now placed a vertical frame, pivoted centrally over a divided horizontal circle (fig. 1), so that the plane of the card that was fitted into it could be made to assume any desired angle (ϕ) with the direction of the arm. A pair of cards on which were similar series of concentric circles were then introduced, the arms being arranged for parallel vision, and the frames directly across them. The binocular resultant was, of course, a circular flat plane vertically across the combined line of sight. The manipulator then turned each frame on its pivot through an angle, whose nature, whether positive or negative, was unknown to the observer, and then passed a spark. For values of this angle less than 30° or 40°, the first spark was usually sufficient to enable the observer to determine whether the binocular resultant, due to opposite obliquity of projection upon the two concave retinas, was itself convex or concave. This was tried successively and independently by Professor Rood, Mr. Share, and the writer, with uniform results, the only difficulty consisting in the previous attainment of proper adjustment for the position of the head, and in adaptation of the ciliary muscles. For larger values of the angle between card and visual line, the degree of dissimilarity between the two retinal images sometimes caused a little confusion, but a few sparks, not in quick succession, were enough to clear all doubts. The diameter of the largest circle being 8 centimetres, and the sum of the incident and reflected rays from its centre to the eye of the observer being 25 centimetres, it becomes possible to calculate the maximum difference horizontally between the two retinal images. Let m and m' (fig. 1) be the points of incidence for rays from the centres c and c', of the circles whose horizontal diameters are ab and $a'b'$, the cards having been revolved each on a vertical axis through the angle ϕ. Then to the eyes whose nodal points are o and o', the pictures appear by reflection at AB and A′B′, the visual lines oc and $o'c'$ being parallel and perpendicular to cc^1. But if directed to A and A^1 or B and B′, the visual lines become convergent to an extent measured by the difference of the angles a and a' or β and β'. The values of a and a' can be expressed in terms of the variable ϕ and the known quantities Ac and co, and we are thus enabled to find for what value of ϕ the difference $a - a'$, becomes a maximum. For the value just assigned to Ac and oc, this condition is attained when $\phi = 52° \ 25'$. By ordinary methods in trigonometry two sides and the included angle of each triangle being known, a and a' are then determined, and their difference found, which in the present case becomes 1° 25′ 37″. Assuming an average value, 15·75 milimetres for the distance from nodal point, o, to retina, R, the linear horizontal displacement on the retina corresponding to 1° 25′ 37″ is a trifle over ·39 milimetres, or more than 80 times the diameter corresponding to what has been estimated to be the *minimum visible*. For angles even smaller than 52° 25′ both Mr. Share and myself found it possible to detect double images at the margins of the binocular picture; this, however, did not prevent the perception of the particular kind of relief, whether concavity or convexity, which the arrangement necessitated. In trying the experiment by continuous light many persons have at first been confused, but a few moments of play of the eyes were enough to produce clear perceptions, and the form of the binocular image thenceforth remained distinct even when the gaze was kept as nearly rigid as possible. Unless there has been special training in biocular vision the duplication of these marginal images is rarely perceived at all.

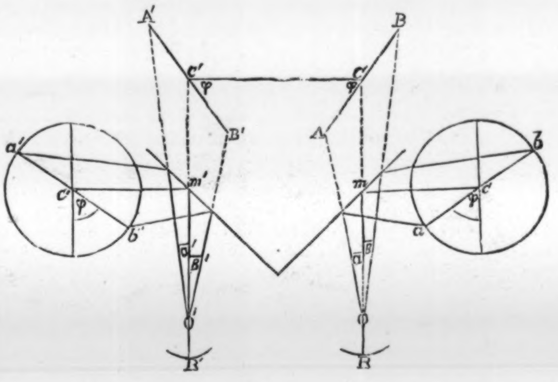

Fig. 1.

On the other hand, to find the smallest retinal displacement through which change of form in the binocular image can be perceived in this manner, I have substituted series of circles in which the maximum diameter was only 4 centimetres, keeping the distance unchanged. The plane binocular image became noticeably concave for a rotation of each through only 1°. By calculation the angular retinal displacement is here found to be only 47″, an amount so small that under the most favourable circumstances no double image could be perceived with the acutest vision thus far tested. These experiments therefore tend to confirm the conclusion reached by Helmholtz,* in opposition to many other physiologists, that neither play of the eyes nor the perception of double images is indispensable to the attainment of binocular relief, however important these elements may sometimes be in confirming our visual judgments, whether conscious or unconscious. They are exceedingly convenient for the purpose of explaining binocular vision, but so limited an explanation can never cover all the facts.

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* "Optique Physiologique," p. 1,007 *et seq.*

In 1864 Professor C. F. Himes described a pair of pictures which he had devised to illustrate the variation in apparent size of the moon when viewed successively at the horizon and the zenith. Within two equal circles, A and A′ (fig. 2), are placed smaller circles,

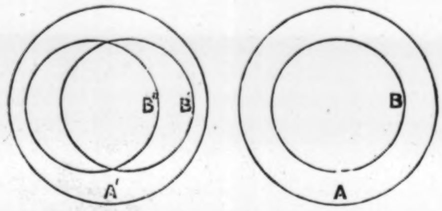

FIG. 2.

B, B′ and B″, the latter equal to each other. A and B are concentric, while the centres of B′ and B″ are on opposite sides of that of A′ and aligned with that of A. On combining the two pictures binocularly, A and A′ at once unite; B and B′ when united form a small circle whose plane is nearer, B and B″ one whose plane is farther than that of A and A′, assuming the union to be by diminished convergence of visual lines. The circle BB″ appears as much larger than BB′ as its distance is judged to be greater, despite the fact that the small circles are all of equal size. On the theory of double images, when BB′ is regarded, the circle B″ remains uncombined while AA′ should be seen double; the comparison of the nearer and more remote combinations being attained by regarding them successively. But in fact the appearance of the three circles, each at its proper distance, is instantaneous and simultaneous, not successive. If the observer's eyes are well trained the circle AA′ may be detected as double while the others are seen single. If the gaze be very rigidly fixed upon the centre of the combined circle AA′, the others are separated, three small circles are seen, but all apparent variation in distance is lost. This stereograph has been examined under the light of the electric spark by both Mr. Share and myself, the results being entirely analogous to those obtained with continuous light. Each circle was appropriately marked and the cards adjusted by the manipulator in such manner that the observer could have no previous knowledge to aid him in determining which combined circle ought to appear nearest. A single spark was usually sufficient to show each in its appropriate place. The circle B has the same effect on B′ and B″ as if it were simultaneously combined with both of them. This apparent combination of one line with two other lines at the same time was noticed by Professor W. B. Rogers in 1856 and further discussed by Helmholtz in 1867, but its bearing on the theory of binocular perspective has not received sufficient attention. It not only shows the insufficiency of the theory upheld by Brücke and Brewster, but also seems to indicate that, if there be any intuitive power of distinguishing between heteronymous and homonymous double images, this power must be understood to extend to cases in which a single line belongs to both kinds of double image at the same time. If we admit intuition at all in this connection we must further grant that a distinction can thus be made instantly between these opposite kinds of images, even when they are so minute that the unaided eyes cannot separate them through an act of conscious judgment; and that this is habitually done by thousands who throughout life fail to suspect even the existence of such duplication in any part of the field of view. If there is any perception of double images, even when the interval between the components is wide, it is by an act of special attention. Many of our judgments, not only in vision but in the performance of other bodily functions, are instantaneous and unconscious; but probably we shall never be able to put an exact dividing line between those due to the experience of the individual and those that spring from tendencies transmitted by the race. We learn to see, just as we learn to walk or talk in infancy, by oft-repeated efforts which form a succession of experiences. If passive seeing be a result of mere inheritance, then active looking is superadded as a result of training. The empirical theory, if sufficient to explain all known facts of vision, can leave no room for intuition, and its resources must be exhausted before any resort to intuition can be deemed necessary.

To test the illusions of abnormal vision by the light of the electric spark, a series of experiments has been made in which the optic angle was varied from 3° of divergence to 50° of convergence of visual lines. The graduated reflecting stereoscope was employed, the mode of experiment being the same as that described in a former paper, the manipulator of the apparatus keeping the observer's record of estimates. Mr. Share and myself relieved each other by turns, taking care to avoid fatigue of the muscles of the eyes, each remaining ignorant of his own record until the entire series of experiments was completed. After the arms of the stereoscope had been arranged to necessitate a particular value of the optic angle the observer opened his eyes, and, by the light of a slow succession of sparks, adjusted them to secure binocular vision of the stereograph of the moon, each picture of which was kept in a fixed position on the arm that carried it. The observer's judgment of the distance and diameter of the combined image was then recorded. Eight estimates for each of thirteen values of the optic angle were made in irregular succession by each observer, the experiments being distributed through two weeks. On examination of the results attained, they were found not to differ materially from those published in a former paper by myself, as secured with continuous light. The limits of error were much wider, as might be expected, showing that any single judgment under such abnormal conditions has very little value; but that, even when there is little opportunity for play of the eyes, the effect of muscular strain on the internal rectus and ciliary muscles is to modify the unconscious interpretation of the retinal image, making the picture look much smaller and nearer, but not necessarily at the intersection of visual lines. Mr. Share's judgments of distance and size were almost uniformly a little less than my own. In cases of optic divergence it was more difficult to secure the proper adjustment of visual lines than in those of convergence. Distinct vision was not attainable for divergence of more than —3°, though with slight indistinctness I found it possible to attain the perception of binocular relief for values as high as —7°. As a limit, therefore, —3° was selected, and this was attained by both observers, through voluntary control of the oculo-motor muscles. Since divergence of visual lines is never necessary in ordinary vision, such adaptation of the eyes if these be normal and not specially trained, requires usually two external points of fixation, and time becomes an element of more importance than when the co-ordination of muscular actions is such as habit has made easy.

THEORY APPLIED BY M. G. CABANELLAS TO THE RECENT EXPERIMENTS MADE BY M. MARCEL DEPREZ ON THE TRANSMISSION OF POWER FROM MIESBACH TO MUNICH.

M. CABANELLAS, who has given much consideration to the questions of production and distribution of energy by electricity, and who is the author of a system of automatic working of such a problem, has just communicated to the "Académie des Sciences" of Paris the following theory: "In the transmission of mechanical energy by means of two identical dynamo-electric machines, the ratio of the speeds does not express the value of the return; the return is equal to the product of the ratio of the speeds into the ratio of the fields."

Those who have had experience with dynamo-electric machines have remarked that for a given number of revolutions, per unit of time, of the generating machine the maximum work is not obtained from the receiving machine when this is allowed to go at half the speed of the generating machine; but for a large number of types of machines, the receiving machine should go at two-thirds the speed of the generator to obtain the maximum mechanical work. This fact, however, is in contradiction to a theory which is found in several scientific works, a theory which admits, explicitly or implicitly, the equality of the fields of the generator and receiver. But it must be granted by every one that from Lenz's law there follows the necessary reaction between the field and the moving current in each machine. The theory of M. Cabanellas takes exact account of all experimental results; his example shows how great this reaction may become with high speeds. M. Cabanellas' communication is, moreover, of great interest on account of the general method of reforming the electric elements, which he applies to the particular case of the experiments of M. Marcel Deprez as to speeds, differences of potential, and current observed at Munich by the engineer who carried out the following experiments in accordance with the instructions of M. Marcel Deprez.* Now that very exact instruments for measuring current and difference of potential are obtainable, the value observed by the easy method of M. Cabanellas for the total work given electrically to the generator has every reason for being much more exact than the value of the work obtained by interposing a transmission dynamometer between the mechanical source of power and the generating dynamo, since at a speed of 2,200 revolutions per minute the error introduced in the traction pull, and thence in the work of one revolution, is multiplied 36 times in the determination of work per second. In this method, M. Cabanellas has profited greatly by his former experiment on the increase of internal resistance of machines when running.

"In a series of studies on electrical machines communicated to the 'Académie des Sciences,' I have analysed the theoretical reasons which differentiate the reflex magnetic and electric elements of a machine, according as this machine is worked mechanically to create electric currents, or is worked electrically to produce mechanical work. But No. 15 du Tome XCV. des *Comptes Rendus* (Oct. 9th, 1882) has, on page 633, a note from M. Marcel Deprez, the conclusions of which prove to me that in the interest of science and its applications, it is indispensable to call attention to the results of the experiments of which I have spoken in a manner sufficiently concise for the figures to be followed. M. Marcel Deprez gives the results of an interesting experiment on the transmission of power to a great distance, which he has made from Miesbach to Munich (57 kilometres of overhead telegraph line). According to the note, the receiving Gramme machine developed half a horse-power, measured on a brake at 1,500 revolutions per minute, an identical Gramme generator at Miesbach running at 2,200 revolutions. M. Marcel Deprez concludes 'That subtracting the passive resistances of every kind, the ratio of the work reproduced at Munich, to the work expended at Miesbach, was as $\frac{1500}{2200}$ = more than 60 per cent.' It was a departure from the above-quoted theory that caused M. Marcel Deprez in the preceding assertion to make an error which is very far from negligible, since I will show *that from the results of this experiment, the return instead of being about 60 per cent. was about 20 per cent.*; that is to say, about one-third as much as the author of this experiment imagined. The above-mentioned notes besides the speeds of the machines and the work reproduced, give only the resistances (*in repose*) of each of the two machines (470 ohms), and the total resistance (line-wire and return) of the telegraph circuit (950 ohms). There would not be in this the elements necessary for a numerical estimation, but I find the following series of figures in a recent publication which relates to the experiment at Munich. Bulletin de la Cie. Internationale des Téléphones: Power transmitted ½ horse-power, resistance of each machine 460 ohms, resistance of line 1,000 ohms, speed of generator 2,100 revolutions, speed of receiver 1,400 revolutions, difference of potential between the terminals of the generator 2,400 volts, and between the terminals of the receiver 1,600 volts, current 0·5 ampères. It will be seen that the two sources of information present in what they have in common an agreement sufficient to permit both to be taken as the base of an approximate calculation. It is reasonable to take without selection the figures of the most complete source which can be applied, although they are a little different from those of the experiment noted by M. Deprez. Let i = current, E, the electromotive force of the generator, e, that of the receiver, r, the resistance of the generator *when working*, ρ, that of the receiver, R, that of the line, ϵ, the difference of potential at the terminals of the generator, ϵ_1, the difference of potential at the terminals of the receiver, t, the mechanical work reproduced per second (kilogramme-metre), t^1, the useless work of the receiver through rubbing of the brushes and resistance of the air, g, the acceleration of gravity. Neglecting at first the work done uselessly, we have:—

$$\epsilon_1 i = gt + i^2\rho \therefore \rho = \frac{\epsilon_1 i - gt}{i^2} = \frac{1{,}600 \quad 0{\cdot}5 - 10 \times 37{\cdot}5}{0{\cdot}5^2} =$$

1,700 ohms, and

$$e = \epsilon_1 - i\rho = 1{,}600 - 0{\cdot}5 \times 1{,}700 = \frac{gt}{i} = 750 \text{ volts.}$$

But the resistance of the machine in repose is 460 ohms, and therefore the increase for 1,400 revolutions is 1,700 — 460 = 1,240 ohms. The increase for 2,100 turns will be $\frac{1{,}240 \times 2{,}100}{1{,}400}$, and hence for the generator, $r = 460 + 1860 = 2{,}320$ ohms, and $\mathrm{E} = \epsilon + ri = 2{,}400 + 2{,}320 \times 0{\cdot}5 = 3{,}560$ volts, and therefore the return is $\frac{ei}{\mathrm{E}i}$ or $\frac{e}{\mathrm{E}} = \frac{750}{3{,}560} = 21{\cdot}06$ per cent., admitting that the current is not less at the receiver than at the generator, which would again lower the return. As verification,

$$i = \frac{\mathrm{E} - e}{r + \mathrm{R} + \rho} = \frac{3{,}560 - 750}{2{,}320 + 1{,}000 + 1{,}700} = 0{\cdot}55 \text{ ampères,}$$

which represents a loss of $\frac{5}{100}$ ampère = 1-11th of the current, in a total length of wire of more than 100 kilometres. The positive and negative tensions vary gradually, from a difference of 1,200 to 800 volts, with the potential of the earth. If it is wished to take account of the work, t^1, reproduced uselessly in the receiver, the formula becomes

$$\epsilon_1 i = gt + gt^1 + i^2\rho t^1,\ \rho t^1 = \frac{\epsilon_1 i - g\,(t + t^1)}{i^2},\ et^1 = \epsilon_1 - i\rho t^1 - \frac{gt^1}{i}, \text{ and since } \rho t^1 = \rho_0 - \frac{gt^1}{i^2} \therefore et^1 = \epsilon_1 - i\rho_0 = e_0,$$

which should be *a priori*. The useless work, t^1, is easy to measure dynamically, and even electrically, by a method which I have communicated, and which has been inserted in the *Comptes Rendus*. In the absence of direct measurements, we may estimate this useless consumption at 1-10th of the mechanical power reproduced by the receiver, *i.e.*, at 3·75 kilogramme-metres per second. The above formula gives us for

$t = 37{\cdot}5$ and $t^1 = 3{\cdot}75$, $\rho = 1{,}550$ ohms, $e = 750$ volts, without any change, increase for 1,400 turns = 1,080, $r = 470 + \frac{1{,}080 \times 2{,}100}{1{,}400} = 2{,}090$ ohms, $\mathrm{E} = 2{,}400 + 2{,}090 \times 0{\cdot}5 = 3{,}445$ volts, $\frac{e}{\mathrm{E}} = \frac{750}{3{,}445} = 21{\cdot}77$ per cent.

"Using the figures of M. Deprez's note for inert resistances, it would be

$$i = \frac{3{,}445 - 750}{1{,}550 + 950 + 2{,}090} = 0{\cdot}58 \text{ ampères.}$$

All our conclusions stand. If in the numerator of i we take account of the difference of potential lost through derivation on the line, we find 0·51 ampères. We have judged it interesting to pass through all the details of the reconstruction of the electric elements, for we might have at once applied the formula—

$$\text{Return} = \frac{gt}{\epsilon i + \frac{\mathrm{N}}{n}\left[\epsilon_1 i - g\,(t + t^1)\right] - a\,i\ \frac{\mathrm{N} - n}{n}},$$

which applies if the line is perfectly insulated. N, n, are the speeds of the generator and receiver, a is the resistance of the machine in repose at the strength of current, i. But the formula—

$$\text{Return} = \frac{gt}{\epsilon \mathrm{I} + \frac{\mathrm{N}}{\mathrm{M}}\left[\epsilon_{1_\mathrm{I}}\mathrm{I} - g\,(t_\mathrm{I} + t^1_\mathrm{I})\right] - a_\mathrm{I}\mathrm{I}^2\,\frac{\mathrm{N} - \mathrm{M}}{\mathrm{M}}}$$

in which $\epsilon_1\mathrm{I}$ is the difference of potential between the terminals of the machine, worked at a speed, M, by a current, I, the work got out by the brake being t_I, and the useless work t^1_I, a_I being the resistance at rest under the strength of current I. The value of the current I at the generator being greater than *i*, the value of the current at the receiver approximating in this case where the line is imperfectly insulated, the formula—

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* M. Cabanellas has since acquired proof of the authenticity of these figures.

$$\text{Return} = \frac{gt}{\epsilon I + I^2 \Bigl[\frac{N}{n}\Bigl(\frac{\epsilon_1}{i} - g\Bigl(\frac{t + t^1}{i^2}\Bigr) - a\,\frac{N - n}{n}\Bigr]}$$

may be employed. With the preceding approximate figures a calculation would give I = 0·65, which would reduce the return to less than 15 per cent.

"The kind of calculation which I have just made shows how useful and practical is the consideration of the increase of internal resistance of machines whilst working; also with what ease it allows a great error to be rectified and of finding the return which a measure of the power expended at Miesbach will give, a measurement which is particularly easy and exact if, as has been remarked, the generator is driven by a separate gas-engine. In fact, when M. Deprez admits that the return is equal to the ratio of the speeds, he implicitly admits the equality of the magnetic fields of the generator and receiver, whereas, through the reflex actions of which I have spoken (electric current in movement inducing magnetism) the generating field was more intense than the magnetic field which the same current would develop with the armature in repose or turning with an open circuit, and the field of the receiver was less intense than this field not influenced, so that according to the figures given, the field of the receiver in this experiment would be three times less intense than the magnetic field of the generator.

"(Signed) G. CABANELLAS."

[This communication has been kindly sent to us by Mr. W. Cross, who received it himself direct from the Author. —EDS. ELEC. REV.]

PROCEEDINGS OF SOCIETIES.

THE SOCIETY OF TELEGRAPH ENGINEERS AND OF ELECTRICIANS.

AN ordinary general meeting of this society was held on Thursday, November 9th, Lieut.-Col. **WEBBER**, R.E., president, in the chair. The minutes of the last ordinary general meeting having been read and confirmed, and the list of proposed new members read, the secretary read a list of donations to the library of the society; he also announced that the *diplome d'honneur* which had been awarded to the Society by the Council of the recent Electrical Exhibition at Paris had been duly received.

The Secretary then read a short paper by Col. **FRANK BOLTON** (hon. secretary) on "Some Further Historical Notes on the Electric Light," bringing the subject up to the 30th September, 1882. The author stated that owing to the favourable reception which his first paper, read before the society in May, 1879, had met with, he had been induced to continue the subject so as to bring it up to date. The conditions in 1879 were different from what they were now, the subject of the electric light was then new. Since 1879 the number of patent specifications, bearing on the subject and published, were considerably greater than those issued previous to that year. The number of electric light patents taken out since the date of the author's last paper exceeded 550. Although, considering the great importance of the subject, it might be thought that the Commissioners of Patents should have undertaken the work of classifying the patents, yet the necessity of this has failed to strike them. Owing to the immense amount of work which a complete classification would have involved, the author only offers the new paper as a supplement to the first one. He referred to the great assistance he had derived from the valuable collection of electrical patents presented to the society by the Commissioners of Patents. The author suggested that if these electrical patents were classed under their various headings and bound up, or a classified index of them made, the labour of searching for any particular patent would be considerably lessened.

A paper was then read by Mr. W. H. **PREECE**, F.R.S., on "The Munich Electrical Exhibition of 1882." The author stated that although a number of invitations had been issued by the Council of the Exhibition, the Post-office had not been amongst the number of those who had received one. England was not properly represented at the Exhibition as a consequence. The display was national, and not international, and moreover, it was decidedly South German, the two principal firms of Siemens and Halske, and Felten and Guillaume, not being represented. Although the number of exhibits was very limited, being but 170, as against 1,700 at Paris, nevertheless the Exhibition was very interesting. Munich was the seat of all Steinheil's discoveries, the telegraph invented by him being brought out there in 1837; this telegraph was quite a practical instrument. The earth circuit was also discovered by Steinheil. The Exhibition was held in a glass building, similar to the Crystal Palace on a small scale. Its object was to bring before the German world the progress of telegraphy, and also to effect experiments, so as to determine accurately the relative merits of different forms of apparatus; its object also was to show how space could be illuminated, the result being highly artistic. The general arrangement of the building was very effective. At the main entrance was a fountain illuminated by the electric light. A striking contrast was obtained by two buildings, one representing the "Past" and the other the "Present." The former was an old hut, containing a table, stool, crucifix, &c., and lighted by an oil lamp; the "Present" was a library of the modern type, artistically fitted up and lighted by incandescence electric lamps. The most remarkable point of all in the Exhibition was the system of technical measurements, which had been arranged for testing the various exhibits. This was most complete, and consequently the certificates which would be given to the different exhibitors, and which would contain the results of the tests, would be of real value. It was decided not to grant medals, but simply the certificates. This arrangement the author considered very good, since it would check amateuring nonsense, for only scientific facts would be given, and those if properly made use of would greatly tend to check the progress of electric companies of a purely speculative nature.

In the nave was a copy of an old Norman church completely fitted with the usual ecclesiastical fittings and furniture, and with a lay figure of a priest; this building was lighted with the Crompton arc light. On the opposite side of the Exhibition was a theatre, lighted with Edison incandescence lamps hung in festoons, an arc light being in the centre; the arrangement by which the lights could be increased or diminished in brilliancy as desired was very satisfactory. The lighting of the picture gallery was decidedly bad. The general results of the lighting confirmed the author in his opinion that arc lights were only suitable for out-door, and incandescence lamps for in-door, illumination.

Amongst the machines for producing electricity there were several of the Holtz type, including that of Voss. A number of hand dynamo machines, costing from £15 upwards, were also shown. The accumulators of Planté were exhibited amongst others, and also a new accumulator invented by Schultze, of Strasbourg. The plates in this arrangement were coated with sulphide of lead and were immersed in sulphuric acid. Owing to the development of sulphuretted hydrogen, which took place at one of the plates when it was being charged, the use of this accumulator was very objectionable.

The display of cables, except that of Berthoud and Borel, was insignificant. A good exhibit of phosphor bronze wire was shown; this material is very durable, light, and strong, but its resistance is high. The firm of Montefiori Levi, however, have a specimen of No. 14½ B.W.G., whose conductivity is said to be equal to that of copper, whilst its breaking strain is equal to that of steel. Specimens of phosphor bronze are now under trial in England.

Amongst the historical apparatus was Soemmering's telegraph of 1829, Steinheil's telegraph of 1839, and the original Reis telephone invented in 1861.

The display of engines was very bad. An exception, however, must be made as regards the exhibit of Messrs.

Ruston & Proctor, of Lincoln, which was extremely good. The author was much struck with the number of old inventions exhibited as new inventions under new names; for instance, the dynamo of Schaeffer was nothing more than that of Siemens, also the dynamo of Neumayer was as like the Edison apparatus as it could possibly be. Amongst batteries the Leclanché pure and simple could be seen under a new name.

Of the dynamo machines those shown by Schuckert were the best, and the report of the jury would, the author believed, tell very much in favour of this invention.

The transmission of force by water-power, distant 5 kilometres from the Exhibition, was shown in full operation. The power was obtained by a turbine driven by falls on the river Iser at a rate of 1,650 revolutions a minute; the current obtained lit up 11 arc lamps, 7 being in the palace and 4 in the grand place. An exhibition of the transmission of power was also shown by Marcel Deprez, the power being obtained from a gas-engine, and transmitted a distance of 34 miles from Munich. The wires were two in number, and were of 4½ mm., with a resistance of 650 ohms. Two gramme machines were used, and the horse-power developed was half. The *loss* was not stated, but a calculation based on the known leakage which takes place over wires in England shows that over a length of 100 miles in damp weather a loss of 60 per cent. would take place, and of 3 per cent. in fine weather. It was an interesting fact, however, to see the transmission of power in actual operation.

In electric lamps there was nothing very new. Crompton's arc lamps were, in the author's estimation, the best; these were worked by Bürgin machines and were the only English exhibits of the kind in the building.

A convenient form of electric light for transport purposes was shown. This consisted of two trucks, on one of which was mounted the engine and dynamo, and on the other was the lamp, which was mounted on an adjustable post which could be lengthened or shortened by a lazy tongs movement. Incandescent lamps of the Edison and Swan type were shown under different names. Cruto's incandescent lamp was, however, a novelty as regards its manufacture; this lamp was formed of a platinum loop in the usual glass globe, on this loop carbon was deposited by keeping the same incandescent in an atmosphere of carburetted hydrogen. When the deposition was complete the platinum was deflagrated, leaving only a tube of carbon. This lamp is said to give 12 candle-power with ½ ampère of current. If this is true it is a step in advance.

In telegraphs there was but little new. England has but little to be taught in this branch, even the Americans have to come to us for fast-speed apparatus. A railway Morse signalling system, for enabling any station on a line to be called up, has the merit of great ingenuity. Telephones were not conspicuous by improvements effected in them, in fact the exhibits rather tended to show how bad telephones could be made. An instrument with a 3 ft. disc, designed to give loud sounds and worked over a line of 30 miles, was shown working, but the result was a mere *fiasco*.

Some exhibitors showed some pretty adaptations of motion obtained by the movement of a telephonic diaphragm.

The effect of deafness produced by holding two telephones to the ears was strikingly exemplified.

Fire alarms, automatic signals, electric thermometers, and lightning conductors were freely exhibited. The free use of lightning protectors was a special feature in Germany, the very complete systems employed being in striking contrast to the state of affairs in England.

Railway signalling was largely represented, the most noticeable being the system adopted on the French Chemin de fer du Nord.

Clocks, bells, water-meters, were numerous, but did not present any remarkable points of great novelty.

In batteries there was nothing new or worthy of mention. Electroplating was well represented.

Medical applications of electricity were largely shown; in particular the effect of applying the poles of an electrical apparatus to various muscles of the face, as shown by a series of photographs, was very remarkable.

The most striking feature in the whole Exhibition was undoubtedly the arrangements for testing the apparatus exhibited. This was most complete and well arranged. One gallery in the Exhibition was set apart for a line of wires on insulators to act as a resistance for measuring strong currents; thermometers were set in the gallery, so that the temperature at any time could be seen, and thus any correction for a change in the resistance of the wire be made. The wires were of copper, and also of iron, and any resistance between one-tenth of an ohm and fifty ohms could be obtained. Various galvanometers were exhibited, graduated by the electrolytic method—a method which, in the author's opinion, is very satisfactory; two zinc plates in a solution of zinc sulphate are used for the electrolytic cell. In order to insure accuracy in the testing arrangements a great number of measurements are made by different experimenters and with different forms of instruments, so that the results obtained may be considered as absolutely reliable. Torsion galvanometers, quadrant electrometers, &c., were used for the purpose. No attempts were made to introduce novelties in the testing, but the best available methods were adopted. The results of the testing and the methods adopted have all been printed, and the author stated that complete copies of these would be presented to the library of the Society. The instruments used would measure all the necessary units, viz., of electromotive force, current, and resistance, but the results would be in Siemens' units, which was a mistake. The resistance of the lamps was measured by the substitution method, and as all measurements were made simultaneously and recorded simultaneously great accuracy and reliability would be obtained. The measurements of horse-power were made in German measure, which is the same as the French, the relative value compared with the English unit being as 736 to 746. The photometric standard was the English candle, and in cases where the comparisons were made with Carcel burners the ratio of the two would be as 9 or 10 to 1. The dynamometer for measuring horse-power was the Hefner von Alteneck. It had been determined to express the power expended in "watts," the watt, which was equivalent to the volt-ampère, was equal to $\frac{1}{746}$ of an English horse-power. As every effort had been made to obtain accuracy in all the measurements the results obtained would be most valuable.

It was arranged that the next Electrical Exhibition should be held at Vienna, and another at Berlin, in the year following. One advantage of these exhibitions was that it gave the small manufacturers a chance of coming forward with some degree of prominence, since large firms were not represented.

The great lesson to be learnt from the exhibitions was that technical work was more exact than philosophical, and that the latter have much to learn from the Society of Telegraph Engineers.

In the discussion which followed the reading of the paper, Mr. R. E. **Crompton** said that he did not agree with Mr. Preece's remarks with reference to the relative utility of arc and incandescence lamps; he thought that the two kinds were both suitable for indoor lighting, but that gas was best for outdoor illumination. As regards Cruto's incandescence lamp, experiment proved that deposited carbon was more efficient than natural carbon; he did not think, however, that the deflagration of the platinum wire in the lamp would prove an economical arrangement. The Schuckert machine he considered to be very good, though practically it was an infringement of the Gramme patent.

Mr. **Lorraine** said that in the Berthoud-Borel cable paraffine wax is not now used, but linseed oil which had undergone a peculiar treatment. The automatic manufacture of the cable was very remarkable, and it is an interesting fact that the machine requires scarcely any attention.

Professor **Forbes** referred to the Gentillé Glossograph as being an interesting exhibit. This instrument consisted of a number of springs which were placed in the mouth, and which made contacts when speech was being uttered. These contacts made five lines on a strip of paper, and from these lines it was possible to decipher what were the words spoken. He referred to the remarkably effective way in which the Edison light in the theatre could be turned up or down. The number of graduations of brilliancy being twelve. The locomotive electric lamp, which was fitted on the engines of a local railway, was wonderfully effective and most remarkably steady. He quite endorsed Mr. Preece's statements as to the excellent way in which the testing arrangements were carried out. As regards the transmission of power question, it was important that the relative sizes of the transmitting and receiving dynamo should be considered. This had not hitherto been done. He considered that Marcel Deprez's experiments were greatly open to criticism.

Mr. A. **Siemens** pointed out that the raising and lowering of incandescent lamps was in full action at the Savoy Theatre.

After a few words in reply from Mr. **Preece** the meeting adjourned.

PHYSICAL SOCIETY.—November 11th.

Prof. **Clifton**, President, in the Chair.

Professor Rowland, of Baltimore, exhibited a number of his new concave gratings for giving a diffraction spectrum. He explained the theory of their action. Gratings can be ruled on any surface of the lines, are at a proper distance apart, and of the proper form. The best surface, however, is a cylindrical or spherical one. The gratings are solid slabs of polished speculum metal, ruled with lines equidistant by a special machine of Professor **Rowland**'s invention. An account of this machine will be published shortly. The number of lines per inch varied in the specimens shown from 5,000 to 42,000, but higher numbers can be engraved by the cutting diamond. One great advantage of their use is that the relative wave-lengths can be measured by the micrometer with great accuracy. The author has designed an ingenious mechanical arrangement for keeping the photographic plates in focus. In this way photographs of great distinctness can be obtained. Professor **Rowland** exhibited some ten inches long, which showed the E line doubled, and the large B group very clearly. Lines are divided by this method which have never been divided before; and the work of photographing takes a mere fraction of the time formerly required. A photographic plate, sensitive throughout its length, is got by means of a mixture of eocene, iodised collodion, and bromised collodion. Professor **Rowland** and Captain Abney, R.E., are at present engaged in preparing a new map of the whole spectrum, with a focus of 18 feet. In reply to Mr. Hilgar, F.R.A.S., he stated that if the metal is the true speculum metal used by Lord Rosse, it would stand the effects of climate, he thought; but if too much copper were put in it might not. In reply to Mr. Warren de la Rue, he said that 42,000 was the largest number of lines he had yet required to engrave on the metal.

Professor **Guthrie** read a letter from Captain Abney pointing out Professor **Rowland**'s plates gave clearer spectra than any others; they were free from "ghosts," caused by periodicity in the ruling; and speculum metal had no particular absorption.

Professor **Dewar**, F.R.S., observed that Professor Liveing and he had been engaged for three years past in preparing a map of the ultra-violet spectrum, which would soon be published. He considered the concave gratings to make a new departure in the subject, and that they would have greatly facilitated the preparation of his map.

Mr. W. **Brown** then read a paper on the "Conservation of Energy and Central Forces." He showed that the doctrine of the conservation of energy necessarily involved central forces, and could not be proved unless on the assumption of a system of central forces. This involved the hypothesis of Boscovich, that matter consists of a collection of centres of force, and the author criticised the objections of Clerk Maxwell, Tait, and others to Boscovich's theory. The paper will appear in the Transactions of the Society.

Professor S. P. **Thompson** read some "Historical Notes on Physics," in which he showed that the voltaic arc between carbon points was produced by a Mr. Etienne Gaspar Robertson (whose name indicates a Scotch origin) at Paris, in 1802. This reference is found in the *Journal de Paris* for that year. Laboratory note-books at the Royal Institution, however, are said to show that Davy experimented with the arc quite as early. The experiment usually attributed to Franklin of exhausting air from a vessel of water "off the boil," and causing it to boil afresh, is found in Boyle's "New Experiments Touching the Spring of the Air." Professor **Thompson** also exhibited an early Reis telephone, made by Philipp Reis in 1861, at Frankfort, and designed to transmit speech. It was modelled on the human ear, one form of transmitter being a rudely carved wooden ear, with a tympan having a platinum wire behind, hard pressed against a platinum-tipped adjustable spring. Professor **Thompson** showed by various proofs that words were actually sent by that and similar apparatus.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer, not necessarily for publication, but as a guarantee of good faith.

Letters, &c., for the "Correspondence" columns should arrive not later than Tuesday morning if they are desired to appear in the following number, such communications to be addressed to the "Editors," Electrical Review, 22, Paternoster Row, London, E.C.

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CORRESPONDENCE.

LEWIS'S PATENT SELF-BINDING INSULATOR.

To the Editors of The Electrical Review.

Dear Sirs,—I think no practical telegraph engineer will feel inclined to question your opinion on the merits of this insulator. It appears to be so very simple, and I should think, so inexpensive, that it must commend itself to every man who has had any experience of the old kind of binding.

In saying, in your article on the above invention in your last issue, that although the old system of binding is "not perfect it cannot be said to be inefficient," you appear to have altogether forgotten the article you wrote on Capanema's Insulator in the Review of the 16th September last, in which the disadvantages arising from the use of binding wire are forcibly pointed out. In saying that the present system of binding only costs ½d. per insulator, I think you should have stated that it costs that sum *every time* the line-wire is bound to the porcelain. Therefore, as an insulator will, especially near large towns, last out a dozen wires, it becomes plain that the first cost is not, as you very fairly put it, everything to be considered in placing a value upon the kind of insulator in question.

I should be glad if Mr. Lewis, or the manufacturers of his insulator, would advertise their address in your next.

Yours truly,

E. T.

London, *November 13th*, 1882.

[Our correspondent will find Mr. Lewis's address in our present issue.—Eds. Elec. Rev.]

FERRANTI *v.* EDISON.

To the Editors of THE ELECTRICAL REVIEW.

SIRS,—Allow me to ask you for an impartial judgment between two systems of electric lighting, viz., that of Edison and that of Ferranti. Which of the two is the better and more to be relied upon? An answer to this question will greatly oblige. Awaiting your esteemed advice,

I am, yours, &c.,

Hamburg. PAUL MERKEL,

Telegraph Engineer and Electrician.

[In answer to our correspondent we can only say that the Edison system has long since passed the experimental stage, and is now successful and reliable. We cannot give any further particulars regarding the Ferranti method beyond what has already appeared in our columns, as it has not yet been made public.—EDS. ELEC. REV.]

ELECTRICAL TRICYCLES.

To the Editors of THE ELECTRICAL REVIEW.

SIRS,—I have read with some surprise the reply of Profs. Ayrton and Perry to Mr. Reckenzaun's letter, which simply contained a courteous inquiry as to the details of their electric tricycle, and evidently was based upon purely scientific principles.

I trust, therefore, that you will permit me to state, through the medium of your valuable paper, that as an old pupil of Mr. Reckenzaun's I feel bound to say a word in his favour: that he is an excellent draughtsman, a competent teacher, an engineer in the highest sense of the expression, and a man of the strictest integrity, I do know; and I do not for a moment believe him capable of the conduct which Messrs. Ayrton and Perry were but too wise to "half conceal."

I know several Whitworth scholars, and successful men who took honours at South Kensington, and who, like myself, owe their success to the excellent tuition of Mr. Reckenzaun.

I think, Sirs, that it is an established fact, that directly a man is successful he becomes a criminal in the eyes of those who would like to be too; nevertheless it seems a great pity that the moral tone of scientific discussion can be lowered to the extent that it must be when scientific men like Messrs. Ayrton and Perry descend to reply to a courteous inquiry by a personal and gratuitous insult.

I am, Sirs, yours very faithfully,

FREDERICK WALKER.

Chief Engineer, Basted Paper Works, Sevenoaks, Kent.

November 13*th*, 1882.

SUGGESTIONS.

To the Editors of THE ELECTRICAL REVIEW.

DEAR SIRS,—Kindly permit an old friend of the ELECTRICAL REVIEW to offer you the following remarks.

Your columns are full of news concerning electric light and dynamo machines, every week's number offers a vast deal of information on these subjects, yet I should be inclined, like poor Oliver Twist after he had eaten the supper allotted by the dietary, to ask for more. In Vols. VIII. and IX. you favoured your readers with very lucid and detailed descriptions of the telegraphic apparatus in use in the British Postal Telegraph Department. Would not submarine telegraphy deserve a similar attention? The latest improvements in the syphon recorder, the beautiful key of Saunders and others, which we noticed among the exhibits of Messrs. Clark, Muirhead & Co., at the Paris Electrical Exhibition, in general, the instrumental arrangements of cable stations, the methods of working long submarine cables, are subjects well worthy of notice. The discussion between Messrs. Varley and Willoughby Smith (in 1879) has thrown a good deal of light on the matter, yet I should say that the student wants a good deal more of it. It might be as well to reprint Mr. Varley's excellent lecture delivered at the Royal Institution in 1867. With regard to the duplex system on cables we have very little information, with the exception of a paper of Dr. Muirhead's in the ELECTRICAL REVIEW, Vol. VII., and a similar one in *Journal Télégraphique* 1881, but those treat the matter rather from a historical point of view. According to Mr. Preece (inaugural address, *Journal Soc. Tel. Eng.* 1880) a great step forward in this direction has been made by Mr. Harwood, of the Eastern Telegraph Company, but with the exception of an incomplete specification, I could find no record of it. The *fac-simile* copies of Mr. Stearn's recorder slips, with which you presented your readers in Vol. VII., p. 163, are decidedly very interesting, but a lucid description of the duplex arrangement would be of far greater value.

Hoping that you will be kind enough to take some notice of my suggestions, I remain yours faithfully,

FOREIGN MEMBER S. T. E.

LIGHTNING PROTECTORS WANTED.

To the Editors of THE ELECTRICAL REVIEW.

SIRS,—The following is taken from the daily press:—

> SHEEP KILLED BY LIGHTNING.—During the thunderstorm on Wednesday, five sheep were killed on the farm of Cotland, Tinwald, belonging to Mr. Richardson. 300 yards of wire-fencing were torn away and the stobs smashed to pieces, and a large portion of the ground was torn up.

When several months ago a case similar to the above came under my notice, it occurred to me that all danger would be obviated by the fixing of earth-wires to the posts here and there, say, every tenth. As the cost would be trifling, perhaps the hint may be worthy of the consideration of farmers and wire-fencers.

I am, yours faithfully,

FAREHAM.

November 10*th*, 1882.

CHROMAS.—We are sorry that we accidentally overlooked your query. The chemical formula of the Fuller bichromate battery (which is now in use in the Post-office) is as follows:—

$$\left.\begin{array}{l} K_2Cr_2O_7 + 4H_2SO_4 = 2KCr2SO_4 + 4H_2O + 3O \\ 3Zn + 3H_2SO_4 = 3ZnSO_4 + 3H_2 \end{array}\right\} 3H_2O,$$

which means that the sulphuric acid in which the zinc is immersed, and the bichromate of potash in which the carbon plate is placed, become decomposed, so that sulphate of zinc and chrome alum are formed.

NOTICE TO STUDENTS.

(ELECTRICAL ENGINEERING.)

THE Editors of the ELECTRICAL REVIEW will be glad to receive correspondence from the students attending the various schools of electrical engineering in London, with the view of ascertaining the ideas of the pupils themselves on the methods of teaching adopted in these schools. We should particularly be glad to hear expressions of opinion from South Kensington, and the Cowper Street Schools of the City and Guilds of London Institute. Several of these centres of instruction have secured a large number of pupils, and as a thorough knowledge of electrical science is now more than ever necessary to the young electrical engineer, it will be interesting to know how far this is really derived from the courses of lectures and experiments to which the students are treated.

Do the Professors in these schools carefully consider their lectures before delivery, in order that they may be understood clearly by mental capacities of varying degree? Are experiments carried out under the direct supervision of the teacher, and are all the effects of the experiments explained to the student? Is sufficient attention paid to a proper understanding of electrical tables and formulæ by means of practical examples and explanations?

Are the classes too large to allow of any individual attention?

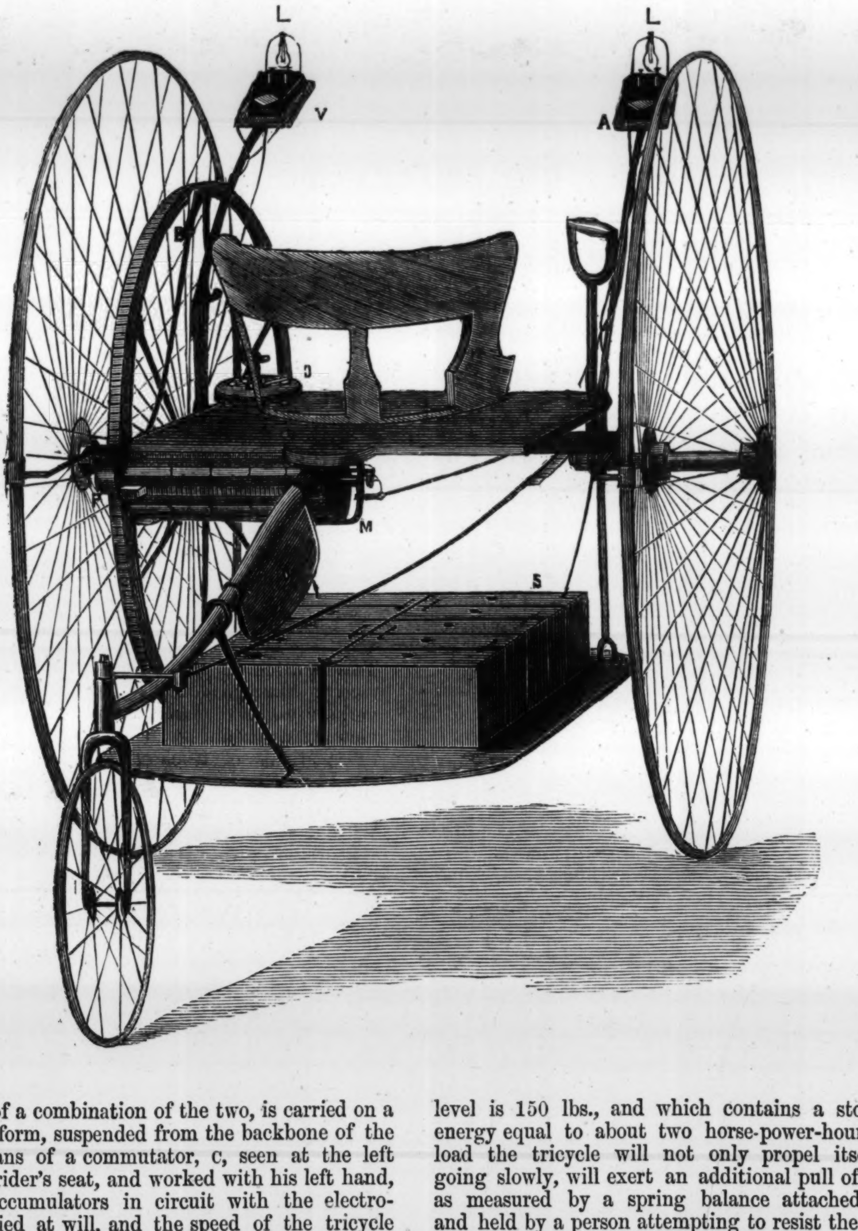
Are questions set at the end of each lecture for pupils to answer in writing during the week?

Do the Professors illustrate their teaching by experimental work performed in view of the entire class?

These, and similar questions which may occur to electrical students, we should be glad to have brief opinions upon for reasons which it is not necessary to state here in detail, but we may observe generally that it is in the interest of electrical science, and especially of the students thereof, that we desire to become possessed of the information for which we now ask.

THE ELECTRIC TRICYCLE.

The accompanying illustration represents Professors Ayrton and Perry's tricycle, which is both electrically lighted and propelled by means of a secondary battery. M is their electro-motor, placed underneath the seat, and the spindle of which is geared with the driving wheel of the tricycle, 44 inches in diameter, by means of the pinion, P, and large toothed wheel. The pinion has 12 teeth on it, and the large toothed wheel 248, so that the motor turns about twenty times as fast as the tricycle wheel, or makes about 1,200 revolutions per minute when the tricycle is going at eight miles an hour. The secondary battery, S, which in the various runs has been composed of Faure cells, Sellon-Volckmar cells, and lastly, of a combination of the two, is carried on a small wooden platform, suspended from the backbone of the tricycle. By means of a commutator, C, seen at the left hand side of the rider's seat, and worked with his left hand, the number of accumulators in circuit with the electro-motor can be varied at will, and the speed of the tricycle altered accordingly. B, is the handle of the ordinary brake, which can be applied with the left hand immediately after turning off the current with the commutator, C. Since by means of this commutator the full power of the accumulators can only be turned on by passing through the intermediate powers, shocks to the tricycle and rider are not experienced at starting. A is one of Profs. Ayrton and Perry's ammeters, which measures at every moment the main current, and V is one of their voltmeters, the readings on which continuously show the electromotive force between the terminals of the motor, so that from the readings on the two instruments the rider can calculate at any moment the horse-power that is being expended in propelling the tricycle. L, L are two small incandescent lamps of about four candle-power each, and which are illuminated by a small current produced by two of the accumulators used also for the driving. The lamps are placed in the position shown, partly for the purpose of illuminating the track, and partly to light the ammeter and voltmeter.



The motor employed is one of their ordinary half horse-power patent motors, weighing 45 lbs., the smallest one that was completed when the tricycle was fitted up, but it is obvious that it is unnecessarily powerful for driving a tricycle. The smallest weight of accumulators that they have yet employed to produce a speed of six miles an hour on the level is 150 lbs., and which contains a store of electric energy equal to about two horse-power-hours. With this load the tricycle will not only propel itself, but, when going slowly, will exert an additional pull of about 33 lbs., as measured by a spring balance attached to its back, and held by a person attempting to resist the motion of the tricycle. With a somewhat larger weight of accumulators they have maintained a speed of eight miles an hour for a considerable time with a man of average weight riding. The tricycle is an ordinary one converted to this new use by taking off the treadles and chain gearing and replacing it with the electric arrangements seen in the figure, but we understand that the designers, encouraged by the success of the converted vehicle, are at present engaged on a tricycle specially suited for being electrically propelled, and in which, among other improvements over the present machine, will be so arranged that not merely the rider but also the accumulators will be hung on springs. In their present form of electric tricycle the ordinary treadles to be worked by the feet are entirely absent, but in their first form the treadles were left on so that the feet and the electric propulsion could, when going up steep hills, be used to help one another, an advantage which may lead them, we are told, to introduce foot treadles as a supplement to the main electric driving power in their third and newest form of electric tricycle.

NOTES.

Notice to Readers.—Subscribers are hereby notified that in future the supply of back numbers of the Electrical Review cannot be guaranteed by the publisher; it is therefore expedient that those who desire to complete their sets should do so at the first convenient opportunity. The publisher also desires to give notice that after December next all copies dated six or more months previously will be supplied only at enhanced prices, that is to say, 4d. numbers will be charged 6d., and others at similarly advanced rates.

Electric Lighting.—At the last meeting of the Leith Dock Commission, a letter from the Electric Carbon Storage and Manufacturing Company, offering to supply the electric light "more effectively and far cheaper than any of their competitors," was allowed to lie on the table.

The Dudley Town Council assembled on Friday evening last week to consider the desirability of making application to the Board of Trade for a Provisional Order. After discussion, the streets and gas committee were given powers to oppose all applications by electric lighting companies for powers to supply the town with electricity.

It was announced at the special meeting of the Pudsey Local Board last week that the Gülcher Company had replied to the communication addressed to them that they had no immediate intention of asking for a Provisional Order for the district. It was ultimately agreed, after some debate, that the board should do so.

According to the Central News St. Petersburg correspondent, a concession has been granted to Mr. A. J. Rosseau, giving him the right to light all the imperial theatres with the electric light. This, it is added, will, it is thought, be an effectual protection against fire.

At Windsor Castle preparations are being made to illumine a portion of the exterior of the palace with the electric light. From the generating machinery recently erected at the rear of the grand entrance in George IV.'s Tower, on the north terrace, wires have been carried over the library and Norman Gateway to the battlements of the flagstaff turret, on the Round Tower, from the summit of which the light will probably be displayed after the return of the Queen from Scotland.

On Wednesday the Birkenhead Corporation specially gathered together for the purpose of considering a resolution "authorising an application to be made to the Board of Trade for a Licence or Provisional Order empowering the supply of electricity for public and private purposes within an area comprising the borough and the districts of Higher Bebington, Lower Bebington, Poulton-cum-Spital, Bromborough, Bidston, Prenton, Noctorum, and Upton, or such part or parts thereof as the Council shall determine."

The Leek Special Electric Lighting Committee have asked the Gülcher Company for details of their proposed scheme for supplying Leek with light.

The shipbuilding yards and sheds belonging to Messrs. Pearce Brothers, Dundee, have for about a fortnight been lighted by electricity. So successful has the installation, which consists of ten arc lamps, proved, that already additional arc and incandescent lamps have been requisitioned. A special Tangye engine for driving the dynamos was supplied by the Northern Electric Light Company, to whose careful management the success is largely due.

In this question the Town Councillors of Perth have followed the lead of Birmingham, therefore no application will be made in the meantime by them for a Provisional Order. The papers relating to the subject have been remitted to the Police and Lighting Committees for careful examination.

On Monday the Broughty Ferry Commissioners appointed a special committee to look after the electric lighting of their burgh.

Since the 10th October last the city of Surat has been lighted by electricity. The result has been pronounced a success.

The guardians of Smethwick and of Willenhall, with the intention of supporting certain companies who have served notices upon them, will refrain from asking Provisional Orders.

At the meeting of the Dundee Gas Commissioners this week, a gentleman in the course of a speech, said:—One word about the cost of the electric light as compared with gas. I had the pleasure of a conversation with Mr. Beckinsgale, manager of the Brush Electric Light Company of Scotland, who is presently here superintending the erection of the lamps in Commercial Street, and in the course of the conversation he stated that the cost of the electric light would not exceed the cost of gas. Being anxious to ascertain from him his data for this, I put a few questions to him, and after a careful calculation I found that the cost of lighting Commercial Street with five arc lamps, for the use of which the company charge 3½d. per hour per lamp, exclusive of the carbons, or say, 4½d. per hour per lamp inclusive of all charges, for one year, on an average burning ten hours per night, would be £342, while the cost of lighting by gas with 25 lamps, being the present number in the street, each lamp burning 5 cubic feet of gas per hour, would only amount to £79. Thus, allowing a good deal for the superiority of the electric light, it appears to me there is such a thing as buying gold too dear.

A special meeting of the Edinburgh Town Council was held on Tuesday to consider a report by the Lord Provost's Committee recommending the Council to apply for a Provisionl Order under the Electric Lighting Act, 1882. The Lord Provost explained that seven different companies were applying to Parliament for power to open their streets in order to light their houses and streets by means of electricity, and this Provisional Order was to enable them to protect themselves, and settle that no power over their streets should be given to any parties except the corporation. Dr. Russell pointed out that bit by bit, departments of the Government were looking after their municipal affairs, and here was the Board of Trade taking the control of their lighting. He hoped that there might be some joint scheme entered into by various corporations whereby this encroachment upon the management of their own affairs might be prevented. Bailie Anderson was glad to be able to say that the suggestion that had now been thrown out, that there should be combined action, was so far already adopted that he fully anticipated there would be united action by the different corporations. The matter was remitted to the Lord Provost's Committee with powers. We understand that the corporation will not supply the light, but arrange with one or more companies for so doing.

Electric Lighting at Brighton.—We learn that Mr. Magnus Volk is fitting up his works and house with incandescence electric lamps. The former will be lighted with Edison lamps of 8 candle-power, and the house with Edison 8-candle and Swan 16-candle lamps. The machine employed for this purpose is a Siemens' D^5, driven by a 2 horse-power nominal "Otto" gas-engine. Mr. Volk is also fitting up the warehouses and shop of Messrs. Wallis and Hacks with twenty Swan lamps of 20 candle-power, and ten of 10 candle-power each, a Siemens' D^7 machine, driven by a 3½ horse-power engine of the same kind as before mentioned, being used to produce the current. On the 2nd inst. he successfully lighted the King's Apartments in the Royal Pavilion with twenty-five Edison lamps of 8 candle-power, ten Swan lamps of 20 and eight of 10 candle-power respectively.

The Standard Fyfe-Main Arc Lamp.—About an acre of freehold ground has been taken at Brixton for the purpose of forming an electric lighting station by the company owning the Fyfe-Main Lamp. We understand that already orders and promises have been received, which will necessitate the development of about 100 horse-power. The engines and boilers will be supplied by Messrs. Shanks & Son, of Arbroath, Scotland. The proprietors of the Brixton "Bon Marché" have given the Fyfe-Main Company instructions to supply them with 24 lamps of 3,000 candle-power each, to light up a portion of their extensive establishment for not less than one year. Like instructions have been received from Mr. Phillips, draper, to fit up two similar lamps outside his shop. Mr. Clark, a jeweller, has already had one of these lamps in operation for some little time, and we believe that the remarkable steadiness and brilliancy of this single light has been the cause of the demands which have rendered it necessary to organise a central station in Brixton. We shall be glad to hear that the company's operations are successful.

THE RIVER PLATE TELEPHONE AND ELECTRIC LIGHT COMPANY.—Mr. John Taylor, director of the River Plate Trust and Loan Agency Company, has joined the board of the River Plate Telephone and Electric Light Company.

MAXIM-WESTON ELECTRIC LIGHT COMPANY.—Mr. Hugh Watts, Leadenhall Street, London, has been appointed managing director of this company.

CHELSEA AND THE ELECTRIC LIGHT.—The surveyor of Chelsea in his Annual Report speaks of the electric light as follows:—"The question of adopting the 'electric light' is still under observation, and continues to receive my best consideration, and some few months since negotiations were opened with Messrs. Hammond & Co., but were eventually discontinued for various reasons. I have not been able to obtain any definite or reasonable terms for its adoption, and am therefore unable to recommend a trial of the system, which appears, however, to be making progress elsewhere. The various Bills promoted by the electric light companies this session were fully considered and reported upon, my suggestions being adopted by the vestry. The Sugg patent improved 80-candle gas burners and lanterns at Sloane Square continue to give very satisfactory results; the extra annual cost as compared with the old system of lighting being £5 2s. 6d. per lamp.

THE ELECTRIC LIGHT AT WATERLOO AND NINE ELMS.—Provision is being made, and rapidly approaching completion, for the adoption of the electric light in the goods yard of the South-Western Railway Company at Nine Elms. The machinery is now complete, with the exception of the engines. The trial is an important one, as, if successful, other companies will follow suit. The Windsor platforms at Waterloo are also to be fitted with Edison's electric light burners, which will shortly be in active operation. The company have also had the board-room fitted with the light, as a test, and it seems likely that the company's gas bill will be considerably curtailed, more especially it the light proves a success upon the platforms and in the goods yards.—*South London Press.*

PROPOSED NEW TELEGRAPH LINE.—Mr. Vidal, an official in the Ottoman Telegraph service, has arrived in Egypt, and has asked permission of the Egyptian Government to establish telegraphic communication between Constantinople and Hedjaz by way of the Soudan.

UNDERGROUND AND OVERHEAD WIRES.—The New York *Herald* says:—The telegraph, telephone, and electric light companies, which are disfiguring the streets and avenues of nearly all our leading cities and towns, attempt to defend their outrageous action by declaring that the underground wire system is still a dangerous and doubtful experiment. Nearly all the telegraph wires in Germany are underground, and the experience of the companies and of the government there is all in favour of the plan which meets with so much opposition here. The city of Pittsburg, in Pennsylvania, has been making some experiments in this direction, and it is needless to say that they are entirely successful. This is a question which must be taken up by New York in the very near future. The unsightly poles, no matter to what company they belong, must come down, and the wires must be put underground.

THE NEW DANGER FROM LIGHTNING.—In the columns of a contemporary, a discussion on the dangers from lightning by the multiplication of over-house telephone lines is being conducted by Messrs. J. W. Gray and Sons, and Mr. Moseley, of Nunhead. The Messrs. Grays deny the truth of a statement that "in cities and towns where many wires traverse a small area, no better form of lightning protector need be wished for than they themselves constitute," and assert that "the smallness of the wires used for telephone purposes renders them useless for lightning conductors. Mr. Moseley, while declaring that the columns of a daily paper are unsuited for a technical discussion, pertinently remarks, "if the wires are useless to conduct lightning *through* a house, they must be far more useless to conduct it *to* a house," and adds, "the larger the number of wires within a given area the greater is the safety, whilst a single telegraph or telephone wire cannot conduct a dangerous quantity of lightning to a house." Mr. Moseley continues, "having many years ago become the fortunate possessor of the gigantic apparatus with which Andrew Cross used to harness the lightning in its greatest force, to make it prove all we know of the apparently fantastic changes of its force and form, I have as much first-hand knowledge of lightning's laws as any member of the Lightning-Rod Conference."

SOCIETY OF TELEGRAPH ENGINEERS AND OF ELECTRICIANS.—The next meeting will take place on Thursday, the 23rd inst., at 8 p.m., when the following paper will be read:—"Notes on the Telegraphs used during the Operations of the Expeditionary Force in Egypt," by Lieut.-Col. C. E. Webber, R.E., president.

THE SOCIETY OF ARTS.—On Wednesday evening last, Dr. Siemens delivered his address to the members of this society. We regret that we were unable to find space for even a brief abstract in our columns this week, the more so as Dr. Siemens very courteously sent us proofs in advance. We shall, however, in our next issue, reproduce those portions of the address which will be of interest to our readers.

HONOURS.—The Royal Scottish Society of Arts Council have awarded a Keith medal, value 10 sovereigns, to Mr. Daniell William Kemp, for his "Description of an Electrical Barometer, a new Apparatus for ascertaining Atmospheric Pressure at any distance."

THE NEW LORD PROVOST OF EDINBURGH.—It will interest many of our readers to learn that Mr. George Harrison, the new Lord Provost of Edinburgh, first as secretary, and next as chairman of the Edinburgh Chamber of Commerce, was mainly instrumental in bringing about the transference of the telegraphic systems of the country from private companies to the government, and that the first use made of the wires on the transference was the despatch of a message of congratulation to him on the event. The reports he had prepared on the telegraphic systems were not only widely circulated in our own country, but translated and published by the Belgian government. The *Courant*, commenting on the appointment, says:—"It was not mere formal or fulsome flattery which dictated the eulogies of Mr. Harrison's proposer and seconder yesterday; for his energies have not been confined to civic matters, but were greatly instrumental in giving the public the benefits of a cheaper and extended service of telegraphs. It would be a fitting sequence to this if Lord Provost Harrison, adding the weight of his new dignity to his personal endeavours, were to manage to induce the Post-office to institute a system of sixpenny telegrams."

CABLE REPAIRED.—The Indo-European Telegraph Company, Limited, announce that telegraphic communication by this company's line has been re-established, and messages are accepted as usual for transmission to India and the far East.

CANADIAN TELEGRAPHS.—The great North-Western Telegraph Company propose laying a submarine cable in Lake Superior under the charter of the company, to connect Fort William, Manitoba, with Ontario. The telegraphic system requires 600 miles of line, with a cable, and another link along the Canada Pacific Railway, over the Rocky Mountains, together with the existing system in British Columbia. Telegraphic communication on Canadian soil and waters, from ocean to ocean, would thus be secured. The proposed line for the laying of the cable is from some point on the Indian Peninsula, north-west of Owen Sound, connecting with land-lines along Manitoulin islands, and small cable links to Sault Ste. Maria, thence by one cable through Lake Superior to Thunder Bay. The estimated cost of the cable is 400,000 dollars.

The International Telegraph Conference.—In our issue of October 21st we gave a full list of the names of the delegates of the various countries represented at the Conference held in Paris. Their labour is for the present terminated, and at the conclusion of their work they were addressed by M. Cochéry and by M. Kern, Swiss Minister, who is the senior member of the Diplomatic body, and also the Swiss representative in this Conference.

There were in all four questions with which the Conference was concerned. The first question related to the protection of telegraphs; the second was to lay down rules for vessels laying or repairing telegraphs; the third question dealt with the rights of telegraph companies; and the fourth question, which seems the most difficult of all, and was discussed after the others, concerned the tribunals before which offences against the International Code are to be brought and the punishments to be inflicted.

The chief articles agreed to are the following :—

The breakage of or damage done to a submarine cable, if caused intentionally or by culpable negligence, having the effect of stopping or clogging, altogether or partially, telegraphic communications, will be punishable, and costs and damages will be recoverable by civil action besides. Any owner of a cable who, in laying or repairing it, shall cause breakage or damage to another cable, must support the expenses rendered necessary by that breakage or damage. Vessels occupied in laying or repairing submarine cables must observe the rules or signals which are or shall be adopted by common consent of the high contracting Powers. When a vessel occupied in the repairing of a cable has made the said signals, other vessels which see or are in a position to see these signals are to retire from the spot or else to keep themselves at a distance of a naval mile from the scene of operations for fear of hindering them; and fishermen's nets are to be kept at the same distance. The ship engaged in repairing the telegraph is to be as speedy as possible in its operations, and any vessel holding off in answer to signals is to be granted a delay of twenty-four hours at the outside. From a buoy indicating either the position, derangement, or repair of a submarine cable, all boats and fishermen's nets must keep away at least a quarter of a nautical mile. In case the owner of a boat can prove that an anchor or a fishing net has been lost by him in his endeavour to avoid injury to a cable, the owner of the cable is to indemnify him; but in order to claim this indemnity the captain of the boat must address a *procès verbal*, supported by witnesses, to the proper authorities within twenty-four hours after his arrival in port. The authorities will give immediate notice to the consul of the nation to which the owner of the cable belongs. The competent tribunals to recognise infractions of this Convention are those of the country to which the offending vessel belongs; and prosecution for offences shall be conducted by the State or in its name. All evidence admissible in the ordinary tribunals of the country shall be admissible in these cases; and *procès verbaux* may be drawn up by officers commanding ships of war or ships specially commissioned for the purpose, whatever the nationality of the offending vessel, such *procès verbal* in each case being drawn up according to the usual forms, and in the language of the nation of the officer who draws it up. In any case of contravention of the regulations of the Convention, judgment is to be given as summarily as the laws and regulations allow.

These are the regulations adopted by the Conference. In addition, the various members pledge themselves to do their best to induce the Legislative Bodies of their respective countries to adopt these regulations and make them both international and domestic laws; and the members are also to inform each other of all laws passed in their own countries with reference to the objects of the Convention. Any State that has not yet joined the Convention shall be admitted on demand, this demand to be adressed to the French Republic, and by the French Republic to the other signatories. The Convention shall continue in force for a space of five years from a day agreed upon by the high contracting parties; and if, twelve months before the expiration of those five years, no one of the Powers shall have given notice of its intention to retire from the Convention, the Convention shall continue for one year, and so on from year to year. If any Power shall renounce the Convention, the renunciation shall only affect that Power.

The Conference hopes that the Powers will agree at once on the signals to be used, both at the laying and at the repairing of a cable; and further that the various Governments shall indicate, by means of buoys placed at the side, the direction of submarine cables, and buoys of uniform type should always be used for the service.

NEW COMPANIES REGISTERED.

North-Eastern Electric Light and Power Company (Limited).—Capital £100,000, in £5 shares. Objects: The ordinary business of an electric light and power company. Signatories (with 20 shares each): * Wm. Wilson, Roker, Durham; * S. Storey, East Beldon, Durham; * J. H. A. Culliford, * Thos. Wilson, * R. M. Hudson, Jun., * W. E. Irish (electrical engineer), and S. Alcock, of Sunderland. Directing qualification, 50 ordinary shares. The shareholders in general meeting will determine the remuneration of the board. Registered 9th inst., by Flint & Co., 49, Fleet Street.

Kerner Burglar Protection Company (Limited).—Capital £100,000, in £1 shares. Objects: To acquire and work the patented invention of Marion Harrison Kerner (No. 1195) for improvements in relation to electric circuits, and in apparatus for protection from burglars. Signatories (with one share each): T. Torrey, 19, Aurial Road, West Kensington; G. L. Audery, Cintra Park, Upper Norwood (electrician); J. B. Henck, Jun., 152, Brecknock Road, N. (electrician); W. L. Goodfellow, Hampstead (electrician); C. M. Turner, 12, Rockbourne Road, Forest Hill; G. Buckler, Catford. Registered 9th inst., by T. Torrey, 19, Aurial Road, S.W.

Australian and New Zealand Electric Company (Limited).—Capital £5,000, in £5 shares. Offices: 1 & 2, Chiswell Street, E.C. Objects: To acquire the right and interest of Lewis Abraham Tallerman in eight agreements with the Maxim-Weston Electric Light Company, Limited, for the use of their apparatus and systems of lighting in the colonies of Victoria, New South Wales, Tasmania, Queensland, New Zealand, and South and Western Australia. The purchase consideration is £1,200 in fully paid shares. The company will also repay £1,000 expended in connection with the said agreements, and £600 for machinery and apparatus agreed to be purchased. Signatories: * L. A. Tallerman, 1 & 2, Chiswell Street, 14 shares; * S. Hoffnung, 13, Basinghall Street; S. Sinclair, 13, Basinghall Street; * H. Nathan, 12, Copthall Court; P. M. Montague-Marsden, 8, Belsize Square; A. Hoffnung, 3 & 4 Great Winchester Street Buildings, 4 shares each; and E. J. Emanuel, 15, Austin Friars, 1 share. Directing qualification: £50 shares or stock. Registered 10th inst., by Lousada and Emanuel, 15, Austin Friars.

French Metropolitan and General Electric Company (Limited).—Capital £1,200,000, in £20 shares. Objects: The acquisition of patent rights, &c. in France appertaining to electricity and electromotive force and the working and development of the same, especially in the departments of Seine, Seine et Marne, and Seine et Oise. Signatories (with one share each): L. F. Brettingham, 26, Bloomsbury Square; G. Ridout, 79½, Gracechurch Street; E. H. Cadiot, 3, East India Avenue; H. B. Green, Manchester; A. W. Gay, 88, Bishopsgate Within; G. O. F. Wilkinson, 32a, Piccadilly; G. V. S. Sleeman, 6, Melor Place, Kensington. Directing qualification: Shares to the nominal value of £500. Remuneration: £3,000 per annum. Registered 10th inst., by Campbell, Reeves, and Hooper, 17, Warwick Street, Regent Street.

* The signatories to whose names an asterisk is prefixed are directors.

OFFICIAL RETURNS OF ELECTRIC COMPANIES.

Electric News Telegraph Company (Limited).—The return of this company, made up to the 27th ult., was filed 3rd inst. The nominal capital is £150,000, in £5 shares. 7,805 shares have been issued, and £3 per share called up. The calls paid amount to £23,227 10s., leaving £187 10s. unpaid. Registered office, 4, Ludgate Circus.

Duplex Electric Light, Power and Storage Company (Limited).—The return of this company, made up to the

2nd ult., was filed on the 1st inst. The nominal capital is £100,000, in £1 shares. 30,394 shares have been taken up; and 12s. 6d. per share has been called. The calls paid amount to £17,004 4s. 6d., and unpaid to £1,992 0s. 6d. Registered office, 9, Soho Square.

CITY NOTES, REPORTS, MEETINGS, &c.

DEVON AND CORNWALL ELECTRIC LIGHT AND POWER COMPANY (LIMITED).

Mr. W. H. Owen presided on Thursday at an extraordinary general meeting of the shareholders of the above-named company held at Cannon Street Hotel. There was a rather small attendance.

Mr. F. B. Lidstone, secretary, having read the notice convening the meeting,

The Chairman, having read a circular sent round to the proprietors, said: The questions then will be whether the company shall be wound-up, and the company reconstructed, or whether the company shall be continued to be carried on. I should like to give you some information as to what occurred at the commencement of the company. The first document placed in my hands the first time I was in London was the prospectus of the Great Western Electric Light and Power Company, in which was a paragraph saying, "This company has secured the concession . . . . for the exclusive right to the dynamo machines and arc lamp of the Brush system, together with a licence for the exclusive rights of use and sale of the Lane-Fox incandescent lamp;" and, further, that one of the most important branches of the business of the company would be granting sub-licences to local companies, giving them the monopoly of sale and the use in their districts of the valuable Brush and Lane-Fox apparatus. Now, gentlemen, I give the Great Western Company credit for acting *bonâ fide* in this matter, and being in ignorance of the fact that they had not the exclusive right as mentioned. That made one feel very comfortable, and did not suggest reasons for doubting that it was true. But from inquiries which the directors of this company have made, they learn as a matter of fact that the use of the Lane-Fox incandescent light has not proved so very valuable as to be worth one moment's consideration; and that there are many other lamps in the market of better value, that may or may not be so. The powers given to purchasers by the Electric Light Bill make the matter of still smaller moment, because they had a right to say which lamp they would use. I do not know that there is anything further as to the facts that I can give you now, but if any shareholder wishes to ask any questions, I shall be glad to give him any information in my power.

Mr. G. H. Terrell said he spoke as the mouth-piece of a constituency, representing nearly half the company, as they held 9,000 shares with £2 10s. subscribed. By the 14th clause of the agreement with the Great Western Company, he found that in the event of the Devon and Cornwall Company commencing to be wound-up it should return its concession to the Great Western, which would be virtually giving them 3,000 shares, representing £7,500. Therefore, in the face of that fact, and of others, he thought to permit themselves to be wound-up at that moment would be suicidal. There was no doubt in his mind that they had very little claim indeed against the Great Western, but that somebody was responsible to the company was manifest. They had subscribed their money for something which was of comparatively little value to them. If they looked at the Electrical Review for July 17th, 1881, they would find the merits of four lights compared, and the Lane-Fox amongst them. He submitted if one case were heard as a test that it would succeed. He proposed a committee of investigation to confer with the directors upon the state of the affairs of the company, and report to the future meeting; and that Mr. Henry Maudsley (a director), Lord Claud Hamilton, and Mr. Mortimer, a gentleman from the West of England, be the committee.

Mr. Fewings seconded the proposition, and explained that he had sent out his circular in ignorance of the fact that the clause alluded to was in the agreement with the company. He addressed the circular in the terms he had done because he gathered somewhat clearly from the circular sent out by the company that the board thought the business of this company could not be carried on.

The Chairman: That was by no means the intention of the language used; there is no intimation to that effect in the circular.

Mr. Fewings replied that he had not said that was the *real* meaning, but it was the inference he drew. He thought they should be very clearly advised as to their rights against the Great Western Company. How did it arise that there was such an unbusiness-like clause in their agreement. There was no such, he was informed, between the Anglo-American and the Great Western. If there were any persons responsible they should be brought forward.

Mr. Russell Evans said there was a similar clause in the agreement of the Anglo-American with the Great Western.

Mr. Fewings supported Mr. Terrell's motion.

In answer to a question,

The Chairman said that their first solicitor was at the same time solicitor to the Great Western Company.

Mr. Howard: A very irregular proceeding.

Mr. Walter Webb said he thought they should face the question at once, whether they were to wind-up or to go on. He did not like the idea of a committee. What did it mean?—a prolonging of this unfortunate matter, ultimately leading to liquidation. He wanted the meeting rather to consider whether they could not strengthen the hands of the directors, and go on with the objects for which the company was formed. It was most undesirable to weaken the hands of the directors by introducing a state of things which a committee would bring about. He felt his interests were safe in the hands of Mr. Maudsley. He thought they ought not to let it go to the world that they were parleying with those litigants who had taken proceedings. If they wound-up they lost all their Brush lights. He thought they would certainly be acting in an idiotic manner if they wound-up, and the appointment of a committee he felt was certainly a step in that direction. He had always deprecated the formation of sub-companies; still these companies were formed under the influence of a rush on the novelty. His idea, instead of a committee, would be that they should go to the Great Western and say, "You launched us; we are met by difficulties here and there; cannot you take us back, and give us shares in your company in lieu of those of the Devon and Cornwall?" If they talked of a committee of investigation he was sure the Great Western would not then entertain such a proposal as his. He urged the meeting to leave matters in the hands of the directors, or ask them to negotiate with the Great Western for the return of this company on suitable and equitable terms. He would propose, "That this meeting, having heard the statement of the directors made in accordance with a promise in their circular of 7th November, expresses its entire confidence in the board, and desires to strengthen its hands in continuing the business of the company, and opposing all hostile action against the company or the directors individually."

Mr. Shippey seconded, and the original motion by Terrell was withdrawn, notice not having been given of it.

Mr. Howard questioned whether, in the face of article 77, any resolution could be put or passed at that meeting. He certainly opposed a winding-up or any committee, for the company was now at a point when such a step might seriously injure it. He thought rather that they should ask themselves the question, "Do you think you have the business that will carry you on?" "Are you *likely* to succeed?" When the directors told them that they had not, or when he came to the conclusion that they had not, then was the time for them to do something.

Mr. Arthur Shippey remarked that he thought the district of this company was one of the best in the kingdom where business could be done. He thought they should repose confidence in the directors.

Lord Claud Hamilton said he intended by no means to support any committee, but to give that to the directors. He was also of opinion that it would be suicidal of them to attempt to wind-up the company. To place the thing in the hands of a committee would be to take all the power out of the hands of the board. He thought this was a storm in a tea-cup, and would soon be past, when confidence would be restored to the Brush system. This was a miserable attempt on the part of some Stock Exchange men to depreciate the whole of the Brush system. He happened to be a director of the parent Brush Company, who gave exclusive rights to use the Brush dynamo and arc lamp, and a "full" licence to use the Lane-Fox lamp. The parent company thought as they only gave a "full" licence to use the Lane-Fox they could charge nothing for it. What had been the result of that mistake?—they had not lost a single sixpence. There was no doubt that the Brush arc light had been a success in America, and why should they be afraid it would not succeed in England?

Mr. Henry Maudsley (a director) said he held 1,000 shares in that company. The conditions under which they had come before the shareholders that day was to get their co-operation and assistance. He was a director also, he must say, of the Great Western Electric Company (but had sent in his resignation, although it had not yet been accepted), and of the Anglo-American, and he believed the shareholders had confidence in his determined purpose and character, and he desired for an honest condition of things, and an honest desire to promote the interests of the company. He was sure the Anglo-American had acted in a suicidal way by charging such exorbitant prices for their patents. Their dynamos were now very much cheaper, and their shares were down from £60 to £19. They apparently forgot that in a grand system like the electric light they should make a small profit and quick returns to get it universally used. Under the circumstances they had damaged the whole blessed business. He had lost £10,000 himself in electric undertakings, and had sold shares £2 10s. paid, for 10s. and 3s. 6d. Did not they think the board had some reason for coming before them that day? He wished to tell them the whole truth, and nothing but the truth, and to do his duty fearlessly. Let them give the board their confidence if they liked, or censure them if they liked, they had *all* made a mistake.

Mr. Collins asked what business had been done or was in prospect that might aid them in expressing an opinion.

The Chairman gave a brief *résumé* of the operations of the company, which showed a total receipt, according to his figures, of £39 10s. Successful experimental installations had been made at one or two places—Penzance and Exeter amongst them, and very satisfactory opinions expressed.

Mr. Collins was sorry the answer was not more satisfactory. Would there be any good in their strengthening the hands of the directors? Did they really think there was a commercial success before them? He did not believe the light was any use in the tin mines; neither did he expect anything from "the winter coming on," for they had it already and no orders with it.

Mr. Webb's "expression of opinion" was then put to the meeting and carried; and the proceedings, which had lasted two hours, terminated.

YORKSHIRE BRUSH ELECTRIC LIGHT AND POWER COMPANY.

An extraordinary general meeting of the shareholders of the above company was held on Wednesday last, Mr. H. W. Lowe presiding. There was a large attendance.

The Chairman said: Ladies and Gentlemen, the meeting which we are holding, I need hardly tell you, is one of the greatest importance.

In fact, we have to decide upon a matter of no less moment than that of the continued existence of this company, or its immediate dissolution.

The recent action of one of our shareholders decided the board to convene this meeting at the earliest practicable date in order that you may hear a full explanation as to the affairs of the company, and also that you may have an opportunity of discussing whatever remarks might fall from us. I am sure I feel, when you have heard all we have to say upon this matter, and also the discussion that may arise, you will have dispelled from your minds entirely that bogey, if I may call it, with which one of your shareholders has been so perseveringly endeavouring to alarm you with. The first matter with which I have to do is to call attention to the circular of Mr. Whiteley, which, doubtless, you have all received. I may say that the greater portion consists of insinuations and accusations, which if they had been launched against an individual, instead of a company, would have placed him in a very dangerous position. It seems to me in these days, a man with some pretence of philanthropic motives can assail a company, make the gravest accusations, bring its credit down to the ground, and from fear of the consequences he would not have dared to take that course as to any individual in business. He states, in language which I am sure admits of no doubt as to its meaning in the first circular, that we held furtive meetings for the purpose of doing something or other which may be considered wrong—something to do with a red herring, I believe. Next he says that in some cases shareholders have been paid up. He goes on to say, "a desperate scramble exists as to who should be paid first." Then again, "It is grossly unfair that a privileged few should get their money back." Then "the substratum of the company is gone in the loss of the exclusive Lane-Fox licence. The directors are meeting each other, asking where the business is to come from." We denied these accusations and denied them most implicitly. He replies that what we say is absolutely untrue. I must remind you that all these expressions were intended to attach themselves to this company. In paragraph 9 he says, "Brought into the calm arena of the courts, let the directors deny, if they can, the allegations I make. If they can to the satisfaction of the court, no one would be better pleased than I would, and I should be happy to withdraw my petition." He must be a very happy man if he thinks that after having done all these things to the satisfaction of the court we should allow him to withdraw his petition. Again, "only 11,000 shares have been *bonâ fide* applied for by the public," and when we have denied this he says he adheres to his former statement and will prove it. I defy him to prove anything of the sort, anything but falsehood of his own statement. As to the number of shares, the directors did not proceed to allotment until 36,633 shares were duly applied for, and the money paid in to our bankers in the usual way on application, and on the allotment being made in due form the balance was paid in to our bankers, with the exception of some very few shares, alluded to at the last meeting. A few people apparently could not find the balance due, but that was a very infinitesimal quantity. In the sixth paragraph of the second circular he says that they have held meetings with the directors of some other of the incriminated companies. I am very happy to have this public opportunity of stating that we have never been, individually or collectively, or has any member of this board been present at any meeting of any such kind, nor has there been the slightest intercourse with any representative of any other company. I also deny most emphatically that we have had any meeting with the Hammond Company, or tried to get any concession from them of any kind. There has been no thought of the matter. The decision of that depends on this meeting entirely. Having, I hope, cleared from your minds any idea of having acted in a dishonourable manner, I want to come to the important question raised as to this exclusive licence to the Lane-Fox lamp. At the earliest meeting of the company we read over these two licences very, very carefully, and no one ever had the slightest idea that there was anything in them, but that they were intended as exclusive licences granted to us. The language of the licence appeared to us, and still appears to be, direct and exclusive, and I must point out that we were not alone in this view, several other companies taking up the same position. I suppose some of their shareholders at least examined the agreements which were open to them; and the directors of these companies no doubt read their licences very carefully; but not one word was heard of any doubt or question on this point until Sir Charles Bright wrote to the ELECTRICAL REVIEW, on the 3rd November, and pointed out that there was a concurrent licence granted to the British Electric Company. I can only say that if we had had the word "full," instead of "exclusive," we should have used the one word for the other, as being of identical meaning; we should not have considered that there was any difference in the reading. I desire to make this explanation to show that as far as the directors were concerned they believed completely that the Lane-Fox licence was an exclusive one granted to us according to the terms of the licence; but when the fact of this concurrent licence came to the knowledge of the directors, our first thought was naturally how far is this company damaged by that fact? I am sure all our desire was to see what we could possibly do to guard against any effects that it might have, and whether it was possible to set up any legal right against such companies as the Brush Electric or the Hammond for compensation. I am frank to admit to you that so far as we knew this, and so far as we now know, we have not suffered one farthing of loss or damage by the concurrent licence. The British Company have no footing whatever in the County of Yorkshire, and even if they had the Lane-Fox lamp is now made by the Brush Company and sold to us from the Hammond Company, making it very largely impossible that the concurrent licensees can produce any lamp superior or even equal to it. Therefore I say in point of fact we have still an exclusive right to the Lane-Fox lamp, inasmuch as ours is superior to any other. Our consulting electrician, Mr. Phillips, is present here to-day, and as this is a matter with which he is quite familiar, I hope he will be able to tell us something in definite terms about this lamp. So far again as Mr. Whiteley's statement is concerned with the directors as to their meeting and asking each other where the business is to come from, I can state that our manager's reports continue to be most satisfactory. We are now just about to complete an installation at Middlesboro' of forty lights working upon the rental system. This, I feel sure from the promises received, will very soon be repeated. There is room there for more than we can do in electric lighting. Each of our undertakings now produces a very handsome profit to the company, as we have given up all idea of working for nothing, or of exhibitions, which all infant companies are obliged to follow up to some extent. If we cannot work at a profit we decline to work at all, for exhibition work means great expense, and it is a question now that electric lighting is better known, whether there is much good in it. We are now engaged in negotiations by tendering for an extensive amount of work. We do not expect to get all of it, but we expect at all events sufficient to give us plenty of work. Our expenses are kept down at a very small point; we have had no preliminary expenses; we began with a clear sheet, and the directors have been careful to weigh every single pound in order to reduce the expenditure, and then if the work turns out not to be sufficient for us to make a good dividend out of at the end of the year, we will at all events be in the position of not having wasted any of your money and having spent it in useless things. At present of course we have to oppose the enormous monopoly of the gas companies, and that takes time to move. One cannot expect that electric lighting can attain success by rapid strides. I can only repeat what I said before that the progress of the company so far has been satisfactory, and it has entailed no great expense. But now as to the question paramount. Is this company at the wish of a few discontented shareholders, and at the instigation of one, to be wound-up, and shall our concessions, which we have paid so much for, be cancelled, as they must be, and revert to the hands of those who sold them? What will be our position after the company is wound-up? The whole of the shares issued must come to a *pro rata* distribution of the assets of the company ("No, no!"). That is my assertion; you may contradict me afterwards if you like. The shares issued must come in for distribution, and if you add to this the enormous charges of liquidators and lawyers, and the usual expenses of winding-up, you may very plainly see that nothing but very bare assets will be left. I am a shareholder, having no interest whatever in promoters or vendors—a simple shareholder, as you yourselves are, and with no other interest except to get this company a success. It seems to me that if this company should be wound-up the result will be that no one will be benefited except the friends and nominees of Mr. Whiteley, for it is usual in these cases for the petitioner to get the order for the official liquidators—the whole business, in fact, becomes his from that moment. Mr. Whiteley describes himself as a surveyor; I venture to say he is also an auctioneer, and he is so accustomed to the "going, going, gone" of his trade, that he thinks he can knock down this company with his hammer. I hope we shall show him that we are by no means so easily knocked down as he imagines. He uses a little artfulness in asking you to be present by counsel at the hearing of the petition. That is that you may ease him of the expenses which he fears may fall upon him otherwise. I shall presently have the pleasure of submitting a resolution to you, but before doing so I shall ask Mr. Phillips to give you some practical explanations as to this lamp, which has been alluded to just now.

Mr. Phillips (engineer to the company) said he held a lamp which was the result of the latest improvement by the Brush Company in the lamps, which were really the result of the labours of Mr. Lane-Fox and his very valuable superintendent, Mr. Evans, and one or two others. The lamp they had now is as different as possible from the original one, as could be imagined. And the cost of the lamp was much diminished from the price, even ten weeks ago, and would be much cheaper later on. The lamp was, as they saw, as simple as could be seen. Mr. Phillips then entered into a technical description of the new lamp at some length (amidst murmurs of "We don't want this lecture"), and remarked that they might get a profit at selling them at 3s. or 4s., whereas they could not get such profit as they could now some time ago by selling lamps at 6s. or 8s., and this as the result of the labours of Mr. Lane-Fox and Mr. Evans; and he thought they had now got a lamp which was so simple that the ordinary servant could fix them. And which would enable them to produce that which was domestic and utilisable. Therefore if any one wanted 1,000 lamps, they did not have to charge them 10s. for each lamp; they could be sold now with a handsome profit at 4s. or 4s. 6d., and they could replace them easily, and get a high candle-power from them. If they wished to know the pulse of the country generally, he believed in Yorkshire, Durham, and Lancashire, they had a good field for business, apart from consideration of patents. The corporation of Leeds were preparing to spend £60,000 in electric lighting to begin with. They required that the company volunteering for the work should make an installation which should be perfect. If, at the end of the year, all went well, that contract for £60,000 was to be obtained, and if they got only 10 per cent. there was £6,000 profit. The Hammond Company were actually estimating in one or two places, getting plans of places, calculating, and so on, and the directors could send then an estimate for the work. If this company only got one-tenth part of the business of Yorkshire it would be more than the company could manage. A company in Sheffield he knew would like to spend £150,000 on electric lighting, and the company that inspired this Sheffield company with confidence would get it or part of it. If this company should get £50,000 of it, it will be worth the having. There was plenty of work there, he was sure, for a company of this kind. Having a lamp so efficient he was sure there was work there, which would give them business. They had before the Patent Office some improvements to make the machinery even more perfect. Therefore he might tell them that all the experiences in companies which may be different from others went towards the benefit of the companies generally.

A Shareholder: Is there one sound?

The Chairman: I should think I am within the mark if I say we have six. If you ask my own opinion I should think we have twelve. The resolution I have to propose to the meeting is "that this meeting hereby empowers the directors to carry on the business of the company, and oppose the opposition of the winding-up petition laid by Mr. Whiteley, and to take such steps as they deem necessary for the protection of the company's interests."

Mr. Bromham seconded the resolution. He expressed his regret that such charges were brought against gentlemen of high character in the city of London, who are exceedingly well known. If Mr. Whiteley had any charge to bring against the board, he thought the best course would be for him to call the attention of the directors to see if they were selling what did not belong to them, and to suggest a remedy for the error, if any. He believed they had business men on the board, and he was willing to leave the matter in their hands. He thought most of the shareholders took shares at that time with a view to their going up in value. He thought their action must be against the Hammond Company, if the mistake was really a substantial one.

Mr. Whiteley then opposed the resolution in a speech of considerable length. He thanked the chairman for his courtesy, although he had been at times facetious at his (Mr. Whiteley's). He had thrown down the gauntlet, and he must expect some knocks back (laughter). But he had not yet said that the misstatements were wilful. The language in his circular was plain and simple, and he was prepared to take the consequence if misinformed. He was informed that furtive meetings had been held by the board, but he was glad to hear the chairman say that was not the case. But that meetings had been held apart from the shareholders there seemed no doubt. He had no animosity against the directors. The company were in a pickle, and he thought he had taken the best course to get out of it. 36,633 shares were applied for before allotment, and were therefore allotted (A voice: "That won't help us"). He had gone on the information he had received, and he should try and disprove that. The chairman went round and round his remarks, but he agreed with him when he said the directors only *thought* they bought the exclusive right to use the Lane-Fox lamp. The chairman having admitted that, he thought he might sit down. A full and exclusive licence was about the same thing. The chairman said that no damage had resulted to the company from their not having an exclusive right to the lamp, but that was a very improper position to take up. The chairman having admitted that the exclusive right was a mistake, he thought he should have stopped there. They ought rather to ask what has been the gain. A great feature had been made of an improved lamp; so that £100,000 had been paid by this company for what was really an imperfect lamp. ("No, no.") Well, one that was capable of great improvement. A great feature had also been made of the Middlesborough lighting, which they were told was *now* nearly complete, although they heard it was in progress in September. The engineer had said they might throw their patent into the fire if they liked, for there was plenty of business; and for this they had paid £100,000! The gentleman who seconded the resolution had pushed his remarks too far; he (Mr. Whiteley) did not make any criminal charge against the board, nor accuse them of dishonourable conduct. What did the directors and the promoters promote this company for: simply for pure philanthropy? It seemed to him that that meeting was somewhat of a farce. They were supposed to have 61,000 shares on their register, of which the Hammond Company held 35,000. What was the use of their coming there and voting on the question? The resolution had been cut and dried, and they had no means of opposing it. But he came there as he had presented this petition, he thought it only right that he should come and defend his action. He had no sinister or ulterior motives, and his intentions were honest. In paragraphs two and eight lie the whole substance of their undertakings; paragraph eight being very naturally suggested by the doings of the Brush Company. This company were deprived of the monopoly of the Lane-Fox, and was it not possible for the Brush Company to go in and tender at a lower price than this company?

The Chairman: No; they cannot do that.

Mr. Whiteley said they had no more right to sell the Brush than the people walking in the streets at that time. He believed the Brush reserved to themselves the right to sell their own lamps ("No, no"). In the agreement they found that the shares should not be allotted unless £35,000 were *bonâ fide* subscribed by the public, which he did not believe was the case by a long way at the time of allotment. Out of their 61,633 shares on the register, they would find that the Hammond Company held 35,000; the Electric Works Company, 5,000; Mr. A. C. Barker, 2,500; Mrs. Barker, 2,500; Mr. P. C. Barker, 2,500. These, he suggested, were not *bonâ fide* public subscriptions, but were all friends or relations of Mr. Hammond. If he kept a shop, naturally he should do business with some of his relations if possible. A Mr. Bentley also held 2,500 shares, and he was, he believed, a subordinate of Mr. Hammond, or his company. So that the company only held 11,633 shares on the 26th September. Even if the Barker family were *bonâ fide* public subscriptions, that only left 21,633. He had not taken isolated action, for he had now 101 shareholders at his back; and he was not a small shareholder now. With reference to two names on the original prospectus as directors, he failed to find their qualification of 125 shares.

The Chairman: They never took up their position; you know that perfectly well.

Mr. Whiteley: I beg you will not contradict me, and throw the lie in my mouth. I did not know it perfectly well. If they had retired, we ought to have known it. He remarked in continuation, that they had been grossly misled, and if they were in fault they should go to those who misled them; but to the board, the shareholders must look. Mr. Hammond, it was stated, said at the statutory meeting, "with regard to the machine referred to, it was the joint production of Sir William Thomson and Mr. Ferranti, and it would be understood how very important a stride was likely to be made when it was said that the machine would for incandescent lighting accomplish something like five times as much as any machine at present in existence." If that was so, what had they paid their money for? The Brush was gone. They were not only crippled in their concessions, but they were also crippled for working capital, for only £23,000 belonged to them. He knew it was no use going to the vote on this question, but he asked for their moral support. He said "wind-up now, while you can get some something out of it. Do not go on with this crippled thing on crutches; it will go down sooner or later."

Mr. H. B. Seeley said he knew they could not succeed on the vote, but he was of opinion that that company had not been legally formed. The prospectus said the first issue was to be 200,000 shares. He ridiculed the idea of the articles of association only being on view in one office in London, when they appealed to the whole country. The directors could not legally float that company with a less number of shares than would give the company a fair chance of success. The company had been floated with about a quarter of what was spoken of in the prospectus. When he found that the company had been floated with 67,000 shares, instead of £100,000 as advertised, he wrote to the secretary for an explanation, which he got, but it seemingly involved a misrepresentation which the directors ought not to have allowed to go forth to the public. He thought there had been a breach of trust in this matter if they could show that at the closing of the lists they had not the minimum number of shares subscribed. All Yorkshire to be lighted with £23,000, and the profits to be divided over £123,000! He was much obliged to Mr. Whiteley, although he himself moved very early in the matter. The eleventh clause of the prospectus stated that the vendors would pay all the expenses of the formation of the company, but in the articles of association it was stated that the directors were empowered to pay the expenses. Why was that difference? He thought the difference there between the prospectus and the articles of association was vital.

Mr. Macallister, who said he was the holder of £1,000, said that a few days after he had paid his money he discovered that only £70,000 were subscribed. It was not reasonable nor proper to allot shares upon such an insufficient capital. It was stated as an inducement that application would be made in due course for a quotation on the Stock Exchange. That was a speculative inducement, because it represented it as a marketable commodity. He had consulted Mr. John Morris, of Messrs. Morris and Company, who said that it was too big a thing for a single shareholder to fight, though no doubt he would succeed. Unless there were other shareholders to join him, he would not advise him to fight it as a private individual. He had listened carefully to the arguments of the chairman, and it seemed to him that the whole question was admitted. They admitted that there was no exclusive right to the Lane-Fox. They said: We have not the Lane-Fox, but we have something else which is better. The question was, first—Had the Hammond Company swindled them? If so, what had the directors done to get their money back? When they found that there was no exclusive right, they should have had a meeting with the Hammond Company at once, and told them that they had induced them to issue a misleading prospectus. But they accepted the situation, and practically parted with £100,000. What valuable property had they got at all? If the directors were satisfied that the Hammond Company had not acted fairly, then that company had deceived them; if otherwise, then the directors had deceived the shareholders. He trusted that the meeting would demand fuller information about their relations with the Hammond Company before consenting to any course of action.

Rev. Mr. Stobart asked if it was the case that nothing had been paid for the Lane-Fox licence, and what actual capital the company had to work with.

Mr. Joseph said that the alleged paucity of capital seemed to have resulted from the lists having been so quickly closed, and he should like to ask the reason why they were so.

The Chairman said that Mr. Whiteley had made several allegations against the honourable character of the board. He said they had held furtive meetings; that, he (the chairman) denied in the most emphatic manner. As to the exclusive licence question, it had come on the board perfectly unawares. They never doubted that the Lane-Fox was as exclusive as the Brush. The first question when the concurrent licence came to light was, What damage had they suffered? They wrote to the Hammond Company, and on 27th October they got a reply, which stated that a copy of their letter had been sent to the Brush Company and promising fuller reply as soon as they were able to give one. Immediately after that came Mr. Whiteley's circulars and winding-up petition, and they at once ceased all further negotiations till they saw the result. But the Hammond Company had always behaved honourably to them, and he felt sure they would settle the matter to their full satisfaction. The Hammond Company had evidently no more knowledge of the concurrent licence than they themselves had. The wording of the prospectus had passed under their review, and was not objected to. Some companies used the word *full* and others the word *exclusive*, and they considered that it did not make the slightest difference. Then Mr. Whiteley had said that £50,000 had gone to the vendors of shareholders money, and then again that it was the friends of the vendors who found the money. If one was true how could the other account be so? They had no means of inquiring the position of those who applied for shares, they might be friends of the vendors or they might not. He himself had not the slightest knowledge of any as friends of the vendors. It had been said that it was quite clear the shareholders would be outvoted. Well, he had asked Mr. Hammond to-day how he was going to act with regard to his vendors' shares. He replied that he was going to exercise no voting power whatever with them (hear, hear), leaving the meeting free to decide one way or another. They wanted the meeting conducted in a straightforward way. It was not a packed meeting; he did not recognise a single friend's face, and they only wanted them to decide on the merits of the case. If they had suffered damage from that exclusive licence, they might depend upon it that they would do their utmost to bring that company to book. How far they might succeed would depend on the strength of their position. As to Middlesborough, he had stated that the works were on the point of completion, and at the previous meeting that they were in preparation. No time had been wasted, in spite of Mr. Whiteley's remarks upon the subject. He calculated, reckoning ten per cent. on the capital, that they would get a profit of 33 per cent. upon the working. The question of necessary capital rested with the directors. It was not to their advantage to have a large sum unemployed in work, simply lying at interest, as some companies had. They should be cautious at first. Electric lighting was a novelty; it had the gas monopoly to contend with, and Englishmen fought shy of a novelty. They had to see their neighbours taking to a thing before they took to it themselves. As to the expenses, the Articles of Association did empower the directors to pay them, but they did not think of anything of the kind. The whole of the preliminary expenses were paid by the vendors, which was what he meant in speaking of beginning with a clean sheet. Mr. Stobart asked whether they had paid anything for the Lane-Fox licence. Their position was the same as that of the Midland. One of the conditions with the Brush Company was that they should give to the Hammond Company the Brush dynamo to use, and in addition to that they gave them the licence to use the Lane-Fox lamp. Perhaps the conditions of the licence may serve to explain why they did so. They knew they could not sell it, since there was a concurrent licence. They therefore had kept within legal bounds by concealing that fact. They had concealed that fact from Mr. Hammond, for he had clearly sold the licence to them. Some shareholders might think that their money should be returned. That was a question of the fair dealing of the directors and the original meaning of the prospectus.

Mr. Maynard said that Sir Charles Bright's letter had taken him thoroughly by surprise. But it did not so much matter for they had not done a stroke of business as to the Lane-Fox, and with the improvements of incandescent lighting, it was openly said that the Lane-Fox was superseded. He distinctly denied the allegations in the circular of Mr. Whiteley as to furtive meeting and negotiations with other companies. He thought winding-up the company would be most disastrous, as he believed at present under their active, intelligent, and restless manager the business was in a surprisingly good condition.

Mr. Seeley asked how many shares were applied for when the lists were closed on 28th May.

The Chairman could not answer that question. If the company had been launched two days sooner their capital would have been applied for five times over. As it was many applications came to return money. The allotments were sent out by 1st June, after very numerous applications, though certainly very numerous withdrawals —which latter they need not have accepted if they had cared to allot at once, as was often customary.

Mr. Maynard said it was the greatest test of a company to keep open so long, so that any withdrawals might be made.

Mr. Seeley wanted to bring out how many *bonâ fide* applications had been received up to that date, exclusive of vendor's shares.

The Chairman said that would require the books of the company.

Mr. Seeley said the directors should have been prepared to answer such a vital question. Where, he might then ask, did the directors expect to get the money for the working of the company?

The Chairman said that they had ample capital as it was. They had an arrangement with the Hammond Company, by which the latter would do work, and they themselves should reap the benefit, if it was too large for them to do themselves. The company had a larger interest in their prosperity than any one else, and had everything to bind them to it. If they had to keep a staff large enough to work all their County of Yorkshire it would require a capital of three or four millions.

Mr. Stobart said that £100,000 had been paid to the Hammond Company and there was left £20,000 to go on with.

The Chairman said that was perfectly correct, or rather £23,000.

Mr. Stobart: Then in fact we are only a small branch of the Hammond Company?

The Chairman: That is simply our position. An idea had occurred to him that if the Hammond Company made a large sacrifice of their shares, cancelled a large portion of them, it would relieve their company of a great incubus. They should do all they could to work all the handles which their position enabled them to get hold of.

Mr. Seeley asked why they could not be wound-up and go on as a branch of the Hammond Company.

Mr. F. Ince, solicitor for the company, said, that having heard what had been said by the chairman and Mr. Maynard, they might surely leave the matter in the hands of the directors. As to the Lane-Fox, in all candour and honesty the concurrent licence should have been stated openly; but he did not think the British Electric, however, would affect them much, because that company had not the Brush machine. A licence for a particular gas-burner would not affect a patent for gas manufacture. It was a rather sentimental grievance at best. He would advise them to avoid liquidation; it paid the liquidators admirably, and the lawyers, but it would never pay the shareholders (laughter).

The seconder of the motion would suggest as a means of avoiding difficulty that Messrs. Whiteley, Macallister, with others, might be appointed as a committee to represent the shareholders and confer with the directors as to the best course for future arrangements of the company.

Mr. Whiteley could not agree to the suggestion. He did not see the good of a conference with the directors. Both had stated their opinions, and would not recede from them. He believed that they were an honourable body of men, but the shareholders' money was at stake, and the question was, how to pay for the mistake they had made? The directors had made a mistake, and simply asked them to trust them again, and they would do the best they could.

The Chairman: I will then put the resolution, "that this meeting hereby empowers the directors to carry on the business of the company, to oppose the winding-up petition by Mr. Whiteley, and take such steps as they deem necessary to further the interests of the company."

The resolution was then put and carried by a large majority, only five or six hands being held up in opposition.

Mr. Whiteley demanded a scrutiny.

The Chairman said that the articles stated that a poll should be demanded in writing by at least seven members, holding not less than 5,000 shares.

This condition not being complied with, the demand for a scrutiny fell to the ground. The proceedings then terminated.

THE BRUSH MIDLAND ELECTRIC LIGHT AND POWER COMPANY (LIMITED).

On Tuesday afternoon an extraordinary general meeting of the shareholders of the above-named company was held at Cannon Street Hotel, under the presidency of Mr. Glyn, to consider the adverse proceedings taken by certain shareholders against the company, and to pass a resolution authorising the directors to continue the business of the company, notwithstanding the proceedings of the dissentient shareholders.

The notice convening the meeting having been read by Mr. H. N. Myers, secretary,

The Chairman said: Gentlemen, we have asked you to meet us to-day, and we are very pleased to be able to meet you much earlier than in the ordinary way we should have done. But our reasons for calling you together are not perhaps altogether so pleasant. Certain shareholders, and I am glad to say they are only small in number, and represent only a small amount—as a matter of fact, there are only 18 out of 800, only representing 149 shares—have, taking advantage of what they allege is a misstatement in the prospectus, thought fit to bring actions against this company for the return of their money. Well, I dare say some of you have noticed that a petition in Chancery has been filed to wind-up this company. This was done by a friendly shareholder—a large shareholder—who has no wish to wind-up the company; but he certainly does wish that these 18 shareholders should not come in and get a priority of claim over us, supposing this mistake should turn out on the decision of the court to be a material one. All this fuss and bother comes from the word "exclusive" having got into the prospectus which was issued in May. It is not denied that we have the exclusive right to the very valuable concession of the Brush dynamo machinery. But it is pretty nearly clear that we have not the exclusive right to the Lane-Fox lamp. We have had some very curious letters from shareholders in which they a little mix the dynamo and lamp together. The Brush dynamo machinery we *have* got, the Lane-Fox lamp we do not appear to have the exclusive right to. But the first question would be, "How came we to say that we have the exclusive right to a thing which we have not?" Well, gentlemen, that is a very hard question to answer. Whether the Anglo-Brush Corporation purposely suppressed the fact that Mr. Lane-Fox had given the use of the light to another company, the British Electric I think, or whether they overlooked it, I cannot say. We have only *pari passu* the liberty to use the light of the British Electric Company in our district. Now, there is another very remarkable thing about this—some of the board of more than one of these subsidiary companies are gentlemen who are also directors of the parent Brush Company. One would have supposed that these gentlemen would have known what they were talking about. There is one thing I should like to tell you. We have a clean licence from the Brush Company to use this Lane-Fox lamp. We got no notice from them in any shape or form that there was any previous licence to the British Electric Company, and I do not know, in the absence of such notice, that we should be supposed to know that any such licence existed. What legal claim there can be against the Brush Company or anybody else I can't tell you; I leave it to our solicitor. I have had so much bother and trouble over this company that if anybody can be made to suffer for this mistake in the prospectus it shall be done. There is another curious thing, that it passed through the hands of solicitors of high standing, through those of our solicitor and those of many others. We have never paid a single farthing for Lane-Fox lamps; we paid for Brush dynamo and machinery. The real secret of the whole thing is this, the solicitors seeing that we had nothing for it, did not go so carefully into the rights as they might have done. Well, all these matters are really legal matters which we have not come here to consider, and really could not settle if we had. We want to see whether we have been injured, commercially speaking, by the loss of the exclusive right to the Lane-Fox. We have not lost, I say, one single sixpence by the loss of the exclusive use of the Lane-Fox. We have got all the lamps we required. That the British Electric Light Company can compete with us in our district is too absurd to dwell upon; and seeing that the Electric Light Bill has compelled us to supply any lamp the consumer chooses to take, I think that the Anglo-American Brush Company could not confer a greater favour upon this company than to take their Lane-Fox and just allow us to buy the best lamp in the cheapest market. There are only two courses before us in consequence of these actions; one is liquidation, and the other going on with the company. But I do not think any gentleman here can consider that the word liquidation is a pleasant one. How should we stand if you liquidated? why, you would have a certain amount of machinery—our great assets would be our concession from the Brush Company. I do not think, however, that anybody would give a large sum of money for the concession. Electric lighting is in rather low water just now, and our plant in the hands of a liquidator would not fetch much. In my opinion liquidation would be simply suicidal. Shall we go on? The answer to that gives rise to the question what have we done up to the present time? The prospectus was issued in the middle of May; of course it took a long time to get into ship-shape—getting agents, officials—so that we have only been actually working about four months. In these four months we have actually paid our expenses, and these expenses not only included advertising and running about for orders, for we have to go after them and get permission to put our light up, but it further included expenses for installations which we have been obliged to make as advertisements at Boston, Chester, Reading, Gainsborough, and Grimsby. These are some of our places at which we have found it absolutely necessary to show that our light would burn. I do not think that a company which in the first four months could pay its expenses is so contemptible a thing as to be wound up. We have made some money out of somebody. We have lighted up the town of Cleethorpes. There we have done very successfully with arc light, and arc light is really our profitable light. Incandescent has not got to that perfection which makes it worth going out of our way to beg for incandescent lighting. Our district is mainly one of factories. We get power at the factories, and the manufacturer can thus afford to put up things so much cheaper than if he had to buy machinery, and so on; there, I think, we shall get some incandescent lighting. At Nottingham we have done very well indeed. We put up an installation there, in the factory of Messrs. Burkin Brothers, and so satisfied have they been that they actually invited their friends to see it. At another place in Nottingham we have done the same thing with another large firm, and at Lincoln we have also done some very good business. Now we have got the following contracts, which are either about to be settled, or which we shall get, and I think when you listen to me you will be much astonished that our officials have accomplished so much in so short a time. In Oxfordshire we have five contracts ready—by the way I would have you understand we do not put up any light now except it pays us. We have in Nottingham four contracts, in Leicester one (very important), which it would not be for the interest of the company for me to name. Carnarvon one, Chester one, Cleethorpes one, Stockport one, Frodingham one. You must not forget this point, that every installation which we put up not only does it pay, but it is an advertisement for us. All these contracts, I gave instructions to our manager, were to await the decision of this meeting. If you choose to liquidate all these contracts go to the wall; if you choose to go on, there is profit enough in them to pay you a very fair dividend. A good many hard things have been said and written about the subsidiary companies and their directors; but I think the best answer is to let a critic alone, and to show by actual working that you are able to prove that you can make a profit by decent legitimate commercial working. What is to be the future of electric lighting I should think nobody could say; it is very clear to me that this company, even if it goes on in the hum-drum way it is going now, will be all right. We are running no risk; we are not like a bank. If we are not able to pay any dividend next year we will not put up anything where we cannot get any profit. It seems to me that liquidation would be idiotic. The proper thing for us to do is to go on in the same quiet way as we are, endeavouring to make as large a dividend as we can. The resolution we propose to pass is, "That this meeting, having heard the statement of the chairman as to the company's position, is of opinion that the business of the company should be continued, notwithstanding the proceedings of the shareholders who have demanded the return of their money; and therefore requests the directors to arrange for the immediate withdrawal of the petition."

Mr. Bedford said that he was sure that himself and his fellow shareholders could not but be gratified at what the chairman had stated as to the progress of the company. It was time such statements were circulated, for they had heard lies and falsehoods from every quarter for the last few months told about them, and they had not said a word in reply. There should be a stand made by those interested in electric lighting. The electric light was not a mere toy, it was an established fact, an industry that was bound to be profitable. In 1881, when he was a small shareholder in the Anglo-American Brush Company, he had visited the United States, and he had become an observer of the system there, and had set himself to find how it was progressing. He found that in factories they were doing a very handsome business. It was no mere tale what was told in the public prints some months since, that the original Brush Company's shares were selling at 7,000 dollars for every 100 dollars' worth. It was really true; they were doing a business that was simply enormous. In New York, in 1881, he found a few lamps only. He found one lamp only in Boston, and that was a Brush arc light at a chemist's shop in Washington Street, of which the chemist himself knew nothing, nor where more were to be seen. He visited other places also, and came away with the thought that so far as the cities and towns of the United States were concerned, the electric light would progress very slowly. In the large towns the politicians ruled, indeed the mayors and aldermen, and the common councillors, and the street commissioners were politicians almost by trade. They were elected for a year or two, and they wanted to make the most of it. By these every effort was made to push aside a new light in the face of the great gas monopoly. On his visit to the United States last September, he was still more interested in the electric light than before, and he was again anxious to find what it was doing in its native home. He was used to the vigour and energy of Americans, but he was surprised when, in New York, he saw the progress made in a year. The Broadway and the Fifth Avenue were simply ablaze. So also was the Bowery, the democratic headquarters of New York. But of the incandescent light he saw nothing: the Brush arc light was in the ascendant all through. Large dry goods houses had it and it was all the go along the side streets. In Boston, where in 1881 he had found a single light, he now found the streets ablaze. In Washington Street, in all the railway stations, it was the only light used, and he did not think he saw one light outside of the Brush system. The question arose, was this a permanency? He could only say that these lamps appeared to have been put up in a very substantial manner, on standards 50 ft. or 60 ft. high, and the gas lamp-posts had been dismantled.

The Chairman: I may be excused for interrupting you, Mr. Bedford, but I should like to say that the gas company at Cleethorpes, which town we have lighted, in a rage took up all the gas mains (laughter).

Mr. Bedford (continuing) said that the lamp-posts in Boston were now used as sign-posts at the corners of the streets. The price of gas had been reduced to 2 dols. per 1,000 ft.

Mr. Braithwaite seconded the resolution. He was glad at the opportunity they had had of meeting the directors, and of hearing the exceedingly frank and satisfactory statement of their affairs. They had not got the sole and exclusive right to the Lane-Fox lamp, but they had of the dynamo machines, and they had that right, too, over fourteen counties of England. A dynamo, admitted to be perhaps the most efficient in the world for arc lighting, was a very valuable concession. It alone could work such a number of lights on one wire; they could have arc lights over a circuit of many miles. The wire for the little bit of Jablochkoff on the Thames Embankment had cost £3,000, whereas the cost of laying a Brush wire would be only £150, and their dynamo was the only one that could send power over a long distance. As the question of accumulators cropped up daily, it might yet be found that the Brush dynamo was the best suited for the transmission of currents of high energy. Their arc lamp was *the* lamp *par excellence*. Nine out of ten of the arc lamps used in this country were Brush arc lamps. It spoke volumes for it that it was used on the Great Eastern Railway, the Great Western, at Charing Cross, and at Waterloo, besides many other parts of the country. It spoke volumes that people would come to them and order a 10-lighter machine for a year, and after a while come back and tell them to take away their 10-lighter and put up two 40-lighters instead. That was sufficient to show that the lamp was a commercial success. With regard to the Lane-Fox lamp, it was a very good one. He had had it in his own house lately—it had lighted them for the last three months. He had also tried others. But with his present Lane-Fox he had not broken a simple lamp since be began running it. The British Electric Light Company, under their agreement with Mr. Lane-Fox, have no right to sell the lamp under the name of the Lane-Fox. They must give it another name, so that nobody would know they were selling the Lane-Fox. They had not yet sold a single lamp in the district of the Midland Company. He thought they had not energy enough. He thought, further, that a sub-company, established only so short a time as theirs, should in the first four months' work—and that in the summer months—pay its own expenses was a very satisfactory concern, and that fact alone highly commended its management. It seemed to him that they would have a dividend on their stock at no very distant date, when he believed the shareholders would think they had got hold of one of the best commercial speculations that had been offered to the public for many years. He would conclude by expressing his confidence in the company and its management—a company with only the small capital of £60,000 paid up, and yet with that sum was doing a sound, lucrative, and increasing business.

The Chairman then put the resolution amidst cries of "All, all."

Mr. Stuart said, before the resolution was put, the question seemed to him rather to be how the dissentient shareholders were to be met.

The Chairman: Well, if that is the case, it is only a question of £230.

Mr. Stuart thought if it was to be paid by contesting matters it was well, perhaps, to see if it was right.

Mr. Paton said he did not see that the question of paying over entered into what they were discussing that day. Somebody was liable for that trifling mistake in the prospectus.

Mr. Braithwaite said if it came to that, that it was necessary, he for one would be happy to sign a little statement, by which the shareholders condoned the error in the prospectus.

The Chairman again put the resolution to the meeting, and it was carried with one dissentient, a Mr. Nash, a holder of 10 shares.

The Chairman said that was all the business before the meeting, and he would ask the shareholders to sign the resolution as they passed out of the room, so that the board might show they had the support of the meeting against any little minority who troubled them in that mosquito kind of business they had had lately.

Mr. Paton in moving a vote of thanks to the chairman for his "truthful, manly, and straightforward" statement of the position of the affairs of the company, said he was an original allottee, and he never meant to part with his shares. He had sufficient faith in the company not to do that.

The motion having been seconded,

The Chairman very briefly replied, and the proceedings concluded.

ORIENTAL TELEPHONE COMPANY (LIMITED).

UNDER the presidency of Mr. John Pender, M.P., an extraordinary general meeting of the members of the above-named company was held at Cannon Street Hotel, on Monday last, for the transaction of special business.

The notice convening the meeting having been read by the secretary, Mr. W. G. Hall,

The Chairman said: Gentlemen, the object of calling you together to-day is to ask you to confirm a sale of rights to a company formed in Bombay; the second to take powers to make similar sales elsewhere without the necessity of calling a special meeting. When I last had the pleasure of addressing you, and referring to the speech, I made the following remarks: "We have not yet attempted any sales of privileges which we hold in India. I expect before long, having now established these important exchanges in the important centres of commerce I have mentioned, and looking to the stations at which the Government wish us to offer them assistance, to adopt the principle which has been adopted in England, of forming small companies, who will pay us a certain sum for the privileges we possess, and that we shall at the same time retain a certain interest in these companies. That is the mode by which we propose to extend our system in India, keeping down our capital account and basing our extensions on the creation of companies who will find the capital to carry out these extensions." The object of the meeting to-day, then, is to ask you to confirm an agreement which we have made with the local company in Bombay for the purpose of carrying out our system in that presidency. We are to receive for our interests there, cash £30,000, less expenses, and shares—£30,000—which will continue, of course, in our possession. This gives us the advantage of local interest in carrying on the work, and it gives us a very good sum to start with, and it gives us, also, about half the working of the concern. We have thought it well to establish and prove our patents, and so we have pursued a different policy from other companies, who have generally sold their interests before they have well established them in any place. We have thought it better to prove the system, showing the people the effects that are likely to arise from the working of it, and upon that principle we have adopted that policy, and the meeting to-day is to confirm the first important sale or arrangement made in that direction. Before asking the solicitor to read the resolution, I think it is right I should give you a little history of our present position, not only in Bombay, but in other parts of the East where we have established our system. In Bombay we have something like 70 subscribers. These are handed over to the new company, and I have no doubt they will show very soon a very much larger number of subscribers. We have also secured the work for the municipality, the police and fire stations. We expect, also, to make communications for the Government, and where the Government take up a system it is generally an acknowledgment of its utility, and consequently others follow. We know the rule that wherever one merchant takes it up another merchant must follow. It is one of those systems which are more or less so concentrated that it becomes a positive necessity in a large commercial town that every commercial house should be in connection with the exchange. We therefore look forward to a very marked success in Bombay when it is under local management, in the hands of men who are deeply interested in its promotion. In Calcutta we are endeavouring to follow out the same course. Any one who knows anything of India and of the peculiar mode with which India is governed, will sympathise with us in the difficulties we have to contend with against the Indian officials. But I am happy to say that the Indian Government, not only those at the head of the Government in India, but all those at the head of Indian Government in England have lately taken a very different view, and are determined to pursue a different policy. They have given me a positive assurance that we shall have fair play. We believe eventually that the small executive will have to give way to the large executive to enable us to carry out our system in Calcutta as we have in Bombay. In Calcutta we have now something like 100 subscribers. I hope next time I meet you I shall be able to announce the formation of a private company there. In Madras we have thirty subscribers, and the Government are now having the system applied to the offices, so that we hope for some extension there. But Madras is hardly the place for going forward rapidly. In Rangoon our last advice told us we have twenty-one subscribers and twenty-four police, and part of the commissioner lines. This place also promises an increase. Kurrachee has been, so far, disappointing; still, when once introduced and in such a climate, we cannot help thinking greater things will follow. In Colombo and Ceylon thirty subscribers, and we anticipate a very considerable increase of our system there. I believe it can be carried out there to a much larger extent through connecting the different coffee estates. In China we are making some progress, but there also we have not gone quite so fast as we expected. We found some of the merchants endeavouring to work a system amongst themselves. They have now formed themselves into one body which is now controlled by us. In Shanghai we have seventy-three subscribers. At Singapore we have a very active system going on; that system was pretty well inaugurated by the Eastern Telegraph Company, which I have the honour to represent. The active manager thought that the telephone might be made a feeder of the telegraph system generally, and he established there a very successful system. We have purchased that from him at very little more than cost. He had one or two merchants associated with him, and we had to pay a small sum for what he had acquired in the way of business. For this we paid £2,990 cash, and an equal number of £1 shares of this company; at present there is a gross revenue of £1,600 obtained from that, the net income being £1,100 a year. There are seventy subscribers. One place where probably we had made greater advances than anywhere was in Egypt, when the unfortunate crisis took place there. I am glad to say we are almost again in good working order. The Government has taken up the telephone; it proved to be of very great use during the time the Admiralty had possession of Alexandria, so much so that they addressed a letter of thanks to the company for the great use the telephone proved to them during the time of the occupation. We shall also, I have no doubt, be repaid by the Egyptian Government for the injury which we sustained during the crisis, and that will amount to something like £8,000 or £9,000. We have now in Alexandria ninety-four subscribers and twenty-one connected with the Government offices—altogether, 132; at Cairo sixty subscribers. We hope in a very short period to establish an independent company there. We have a telegram to the following effect: "The reinstatement of telephonic communication in Alexandria is approaching completion. By next mail I hope to send you a list of subscribers connected up." It is a sign of the progress of the telephone to be able to state that notwithstanding the revulsion of affairs in Egypt we have not virtually lost a subscriber. You all know of the destruction of the houses and property in Alexandria, so that I think we have a good deal before us when the city is rebuilt, and I look forward to Egypt being a very important station in the future. We have, notwithstanding all this state of things, received the first remittance of money from Egypt. It is true it is small a sum; but when once started we shall be receiving it steadily. The first system which we had opened, taken over from the vendors, was in the Hawaiian Islands. The Exchange in Honolulu has 260 subscribers, 30 of them being from the Government with an application for about 30 more, there being there a good revenue of 10,000 dollars a year, our interest in the company being one-half. Looking to the territory which we occupy, the telephone is so well suited for it, that it is merely, in my own opinion, a matter of time. In Australia—Sir Julius Vogel is there at the present time looking up that part. We have altogether about as much in hand now as our capital enables us to deal with. We have only had £60,000 cash to carry on all this work, and until we sell some of these systems, we think it is not desirable to unduly push them so as to put us under the necessity of making calls upon our shareholders. We can meet these requirements better by issuing the 20,000 shares which we got back, or rather which we kept back from the vendors in the settlement with them on account of some little irregularity. We have really 25,000 shares, 20,000 of which we propose to issue. These shares are something like 16s. in the market; we propose to issue them to the shareholders at 12s. 6d. or 2s. 6d. above par, thus giving the shareholders the opportunity of taking them *pro rata*, according to their holding. That will give us £10,000, because there is only 10s. paid up on our shares, and with the sum of money which comes from Bombay I hope we shall be able to pay our first dividend to the shareholders, and this probably before the end of the year. With these remarks I shall ask the solicitor to read the agreement with the Bombay company; I may say that we have in Alexandria 132 subscribers; in Cairo, 60; in Bombay, 81; in Calcutta, 108; Madras, 30; Rangoon, 36; Kurrachee, 15; Colombo, 30; Hong Kong, 15; Shanghai, 73; Singapore, 70; Honolulu, 289. The Chairman then proposed the following resolution: "That this company hereby approve, ratify, and confirm an agreement dated the 8th of August, 1882, and made between Clement Davidson Leggatt, as the agent of this company in India, of the one part, and John Grey Russell, as the trustee for and on behalf of a company then about to be formed and incorporated under the name of 'The Bombay Telephone Company, Limited,' of the other part, whereby it has been agreed, subject to confirmation by this company, to sell the business, goodwill, plant, and property of this company in the Bombay Presidency, Scinde, and Hyderabad, Deccan, to the said 'Bombay Telephone Company, Limited'; and do hereby authorise and require the directors of this company to carry such agreement into effect, either with or without any modification or new terms, which they may agree to on behalf of this company."

The Solicitor to the company here read the agreement, after which

Mr. Ackers inquired whether there was any real meaning in the statement in the agreement with reference to the Native States of India. There was nothing in the resolution to that effect, but the agreement states that it should be the right of the Bombay Company to sell the rights of this company in all the Native States of India.

In answer to Mr. Knight,

The Chairman said they would take in outlying places of the Native States, such as gentlemen's domains. The Bombay Company were entitled to deal with these private gentlemen, and the more they got of them the more profitable would the enterprise be to the company.

Mr. Knight said the doubt that was raised in his mind as to. whether the agreement applied to the whole of the Indian Native States was raised by the fact that Hyderabad was not under the political control of the Bombay Government. Some were under the control of the Supreme Government; all the Deccan States were under the control of the Bombay Government. He thought the statement in the agreement would mean all the Native States. He thought it needed to be qualified by some statement so as to confine it to the political control of the Bombay Government, if that were so.

The Chairman remarked that those Independent States were independent only so far as their revenue was concerned, but were subject more or less to the supervision of the English Government. The outlying places would afford them capital material for work. It would be a great thing to get these Independent Native States worked. The board thought it was better that these should be worked by the Bombay organisation, because they believe there was more enterprise there than in any other centre in India.

Colonel Gouraud, one of the directors, said that the significance of the important questions which had been asked was covered by the fact of the questioners retaining such a large interest in the shares of the company. Still, they could hardly over-estimate the importance of the questions asked. He wished to speak first as a shareholder, his excuse being that he had a very large interest in the company. He had taken but an insignificant part in the negotiations with regard to the Bombay Company—in fact he was not in the country when these negotiations were carried on. On his return, this being the first sale, and carrying out that line of policy which the chairman had indicated at the last meeting, he had made an exceptional investigation into the terms of the contract, for which perhaps he had had an opportunity exceeding that of any other shareholder. He had made this investigation very thoroughly. He was happy to say that he had found that it was an exceptionally favourable contract for this company. He had had something to do with nearly all the contracts which had been made for the sale of concessions since the birth of the telephone. He looked upon it as a good augury that the Bombay merchants had joined the board and would be responsible for the management of the company in Bombay. They must not think that the good bargain on their side was a hard bargain for the other side. It had been a case of give and take. They had something which was wanted in Bombay, and which they could not get on without. There was no civilised community who could get on without telephonic communication. They were then conferring an inestimable advantage, and they had the advantage of the local support that insured the success of such an enterprise as theirs. The Americans had brought over the telephone, and when they had got it inaugurated they had looked about them for gentlemen to take it off their hands, as this company had done in Bombay. Knowing what he did of telephonic enterprise he would venture to say that the Bombay company would be a great success; he did not see how it could fail. Speaking now from a director's point of view, there was one thing that was not generally appreciated or understood in this telephone business, and it bore with great significance upon the value of telephone share property. When he said telephone share property, he meant that class of telephone company whose business was chiefly what they called telephone exchange business. Where they once established the telephone exchange in a mercantile centre they had the safest kind of investment that money would purchase, because where once people used the telephone they never gave it up, unless they gave up business, having made a fortune, or become bankrupt (laughter). It was a fact in the statistics kept by the United Telephone Company, it was noticeable that not a single instance was recorded of a firm withdrawing from an exchange. The next advantage of telephone property was the absolute impossibility of competition. He knew of no monopoly in business which was such a monopoly as the telephone exchange business, because there could not be two telephone exchanges. It was a monopoly with the very best possible security. In a foreign concession which we had recently been one of a party to acquire, the Government had actually stipulated that it should be an exclusive concession as long as business was done. It bore also with great significance upon telephonic share property.

Mr. Knight thought it should be distinctly understood by all present that this was a concession for all the States.

The resolution was then put to the meeting and carried.

The Chairman then proposed the second resolution, which was as follows:—"That the clause or sub-section marked (*c*) contained in the 60th of the company's Articles of Association be repealed, and that, in lieu thereof, the following shall henceforth stand and be the clause or sub-section marked (*c*) contained in the said 60th article; that is to say: '(*c*) They may of their own authority sell all, or any part, of the business, goodwill, patents or patent rights, and property of the company, or the business, goodwill, patents or patent rights, and property appropriated for, or appertaining to, any branch of the company's business, either wholly or partially, for cash or for shares, debentures, or other interests in any company or corporation, or to any person or persons; and if deemed expedient, the directors may hold or (so that the capital of the company be not thereby reduced) distribute in specie among the members in proportion to their holdings, or otherwise deal with such shares, debentures, or other interests.'"

Sir A. Armstrong, K.C.B., seconded the motion.

Mr. Kendall said he understood the board had withheld 20,000 shares, which they now expected to issue. He understood the vendors' shares were deferred shares?

The Chairman said the board would not have issued these shares without taking the very best opinion to do so. They were really original shares, and had never been issued; they were still in the possession of the company.

Mr. Kendall asked if the chairman would say, *ex cathedrâ*, what was the position of the ordinary and deferred shares.

The Chairman said the vendors' shares were deferred shares, upon which they were not to receive any income for five years, unless the shareholders had received 6 per cent. before that period. The ordinary shareholders must receive 6 per cent. first; but at the end of five years the deferred shares come in for pay.

The Solicitor then read a document showing that the shares were similarly situated.

In answer to Mr. Kendall,

The Chairman said if the ordinary shareholders received their dividend the clause as to deferred shares would be abrogated.

The Solicitor said the deferred shares were only made such by the contract with the vendors, and therefore when that contract was modified the shares became as ordinary shares of the company again. They made special conditions with the vendors that that should be the case.

Mr. Ackers said he should like to know the names of the present directors.

These having been read over,

Mr. Ackers said that the names of Mr. Bell, Mr. Edison, and the Hon. G. G. Hubbard appeared in the prospectus, but they were no longer on the Board.

The Chairman explained that according to the rules a director must attend at certain intervals, and if they were absent from the board for six months they were no longer directors. It was important that the names of these three gentlemen should be associated with the company simply on account of their association with the patents. As they lived in America, it was impossible for them to attend the meetings of the board; so their names had dropped out; but if it was the desire of the shareholders these gentlemen would be glad to remain directors, if they could alter their articles of association, so as to admit them as honorary or permanent members of the board.

Mr. Ackers said if that could be carried out he should be glad. Their names would give a great additional weight to the good working of their company.

The Chairman said he entirely agreed with the sentiments of Mr. Ackers' remarks. He believed that men whose names were associated with the telephone in such a manner as were those of these three gentlemen, should be kept as honorary members of the board, as showing the interest they felt in the growth of their children. The Chairman added that during his visit to America he had occasion to see a great deal of the telephone. He was struck with the extent to which it was used there. It seemed to be a part of everything there; no matter if you wanted the slightest tit-bit of information you got it immediately by telephone. This caused him to look at the statistics of telephones generally throughout the world. In a little book in French, called "The International Telephone," he learned that so far as they could ascertain there were 37,187 telephones in use; but this did not, perhaps, represent one-third of the instruments in use. As a matter of comparison, he found that only 4,946 were used in England, so that there was yet a very wide field for telephonic enterprise. From what he saw in America he felt a little ashamed that Englishmen were so far behind Americans in this matter.

The resolution was then put and carried, and a vote of thanks to the chairman concluded the proceedings.

RIVER PLATE TELEPHONE AND ELECTRIC LIGHT.—The directors have announced to the shareholders their determination to issue 2,950 more of the £5 preferred shares, in order to repay the advances obtained from the Consolidated Company, and to meet the exigencies of the daily increasing business of the company. The progress so far made is described as highly satisfactory, the total number of subscribers at Buenos Ayres being 564, and at Monte Video 132, bringing in an annual income to the company of £12,228. The new shares are payable £2 10s. on application and £2 10s. on allotment.

GREAT WESTERN ELECTRIC LIGHT AND POWER.—A petition for winding-up was presented on the 8th instant, and will be heard before Mr. Justice Chitty on the 18th instant.

QUOTATIONS.

Authorised Issue.	Share.	Name.	Paid.	Closing Quotations. Nov. 15.	Business Done.
		ELECTRIC LIGHT.			
40,000	10	Anglo-American Brush Co.	4	11-11½	11⅜.⅛.11.½.⅜.¼.⅓.1/16.11.3/16.5/16.⅞.¼.⅜.⅝.5/16.¼.3/16.⅜.¼.½.12.11⅛
		Do. Do.	10	21 - 24	22¾
30,000	5	Australasian Electric Light, Power & Storage Co.	3	1¼- 1¾	
24,900	10	British Insulite Co., Limited, "A" Shares	5	4 - 5	
30,000	5	Brush Electric Light & Power Co. (Scotland)	2½	¾- 1¼	
25,000	5	Great Western Electric Light & Power Co.	2½	½- 1	
24,980	5	Hammond Electric Light & Power Supply Co.	2½	5 -5½	5.5/16
40,000	5	Indian & Oriental Electrical Storage Works Co.	2	1 - 1½	
172,500	1	Maxim-Weston Electric Light and Power Co.	1	⅜- ⅝	
40,000	5	Pilsen-Joel & General Electric Light Co.	2	1¼- 1¾	
..	..	South African Brush Electric Light & Power Co.	2½	¾- 1¼	
100,000	5	Swan United Electric Light Co., Limited	2	1¾- 2¼	
		TELEGRAPHS.			
2,116,400*l*.	Stk.	Anglo-American, Limited	100	47½- 48½	48.¼.8
2,441,800*l*.	Stk.	Do. Preferred } Def'd. receiving no div. until	100	78 - 79	79.8
2,441,800*l*.	Stk.	Do. Deferred } 6 p. c. has been paid to Pref.	100	17½- 18½	18.17¾
130,000	10	Brazilian Submarine, Limited	10	13¾- 12	xd.
16,000	10	Cuba, Limited	10	9½- 10	
6,000	10	Do. 10 per cent. Preference	10	16 - 17	
13,000	10	Direct Spanish, Limited	9	6¼- 6¾	7.6⅞
6,000	10	Do. 10 per cent. Preference	10	15½- 16½	
65,000	20	Direct United States Cable, Limited, 1877	20	11½- 11¾	11 7/16.½
100,000*l*.	100	Do. 6 per cent. Debenture, repayable 1884	100	100 -103	
380,000	10	Eastern, Limited	10	10½-10¾	10 11/16.¾.11/16
70,000	10	Do. 6 per cent. Preference	10	12¾- 13¼	
232,000*l*.	100	Do. 6 do. Debentures, repayable Oct. 1883	100	100 -103	
200,000*l*.	100	Do. 5 do. do. Aug. 1887	100	101 -104	
200,000*l*.	100	Do. 5 do. do. Aug. 1899	100	103 -106	
199,750	10	Eastern Extension, Australasia & China, Limited	10	11⅜- 11⅞	
320,000	100	Do. 6 p. c. Debentures, repayable Feb. 1891	100	108 -111	
500,000	100	Do. 5 p. c. (Australian Gov. Subsidy) Deb. 1900	100	104 -107	
140,000	100	Do. do. registered, repayable 1900	100	103 -106	
100,000*l*.	100	Do. 5 per cent. Debenture, 1890	100	101 -104	
254,300*l*.	100	Eastern and South African Limited 5 per cent. Mort. Deb. Registered redeemable 1 Jan. 1900	100	102 -105	
345,700*l*.	100	Do. do. do. To Bearer	100	102 -105	
22,050	10	German Union Telegraph and Trust, Limited	10	9¾- 10¼	
163,390	10	Globe Telegraph and Trust, Limited	10	6⅜- 6⅝	6½.7/16
163,209	10	Do. 6 per cent. Preference	10	12⅝- 12⅞	12¾.13/16
125,000	10	Great Northern	10	12¼- 12¾	
100,000*l*.	100	Do. 5 per cent. Debentures	100	100 -103	
31,200	10	India-Rubber, Gutta-Percha and Telegraph Works	10	27½- 28½	28½
100,000	100	Do. 6 per cent. Debentures, 1886	100	100 -103	
17,000	25	Indo-European, Limited	25	30½- 31½	xd.
38,148	10	London Platino-Brazilian, Limited	10	4¼- 4¾	
12,000	10	Mediterranean Extension, Limited	10	1¾- 2¼	
8,200	10	Do. 8 per cent. Preference	10	8 9	
9,000	8	Reuter's, Limited	8	12½- 13	
280,000	Stk.	Submarine	100	245 -255	
58,225	1	Do. Scrip	1	2⅜- 2⅝	
4,200	Cert.	Submarine Cables Trust	100	102 -106	102
37,350	12	Telegraph Construction and Maintenance	12	31½- 32½	32⅜
150,000	100	Do. 6 per cent. Bonds, 1884	100	101 -104	
186,750	5	Do. 2nd Bonus Trust Cert.	5	1⅜- 1⅝	
30,000	10	West Coast of America, Limited	10	5 - 5½	
150,000	100	Do. 8 per cent. Debentures	..	..	
69,910	20	Western and Brazilian, Limited	20	7½- 7¾	7¾
200,000*l*.	100	Do. 6 per cent. Debentures "A" 1910	100	104 -107	
2,500	100	Do. 6 p.c. Mort. Deb. series B of '80, red. Feb., 1910	100	97 -100	
1,500	$1,000	Western Union of U. S. 7 p.c. 1 Mort. (Building) Bds.	$1,000	121 -124	
1,030,000*l*.	100	Do. 6 per cent. Sterling Bonds	100	100 -103	
88,321	10	West India and Panama, Limited	10	1¼- 1½	1 7/8.3/8.7/16
34,563	10	Do. 6 per cent. 1st Preference	10	7 - 7½	7 5/16
4,669	10	Do. 6 do. 2nd do.	10	5¾- 6¼	
		TELEPHONES.			
154,165	1	Con. Telephone & Maintenance, Ld. Nos. 1 to 154,165	1	1 - 1¼	
200,000	1	Oriental Telephone Co., Nos. 100,000 to 300,000	½	¾- 1	¾
100,000	5	United Telephone Co.	5	10¾- 11¼	

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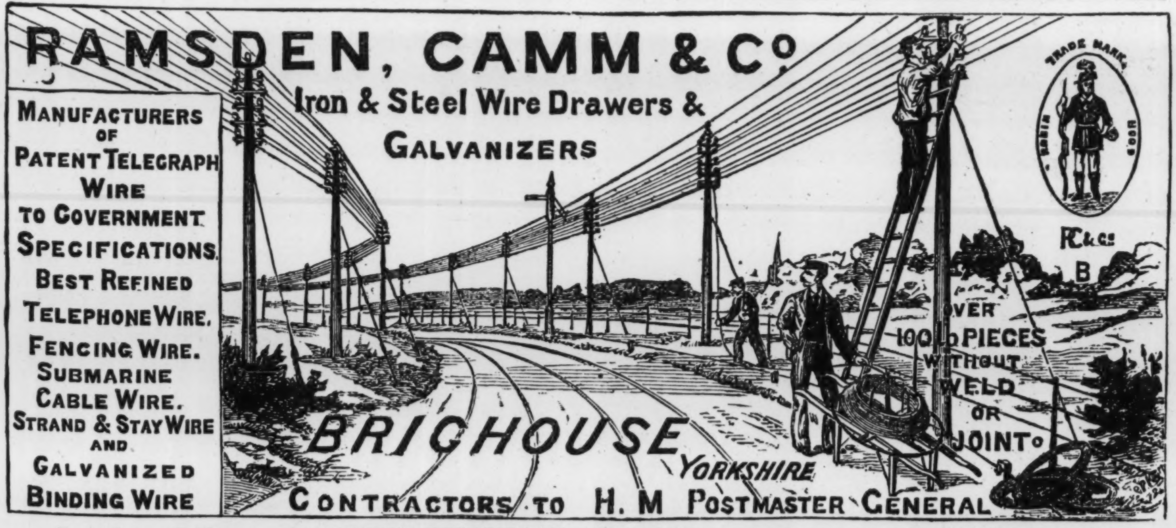

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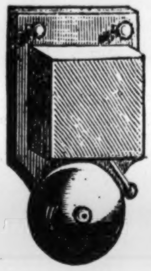

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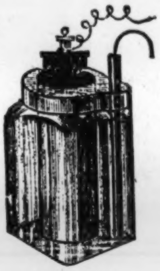

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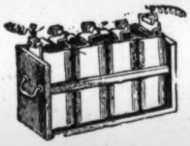

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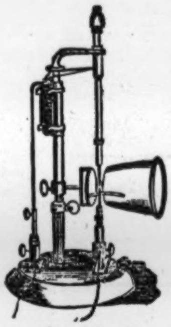

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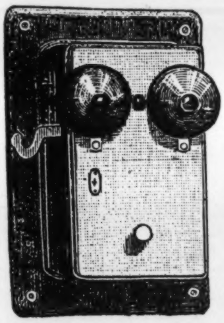

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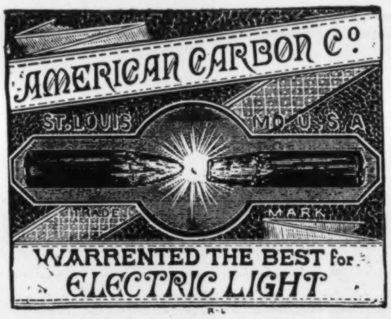

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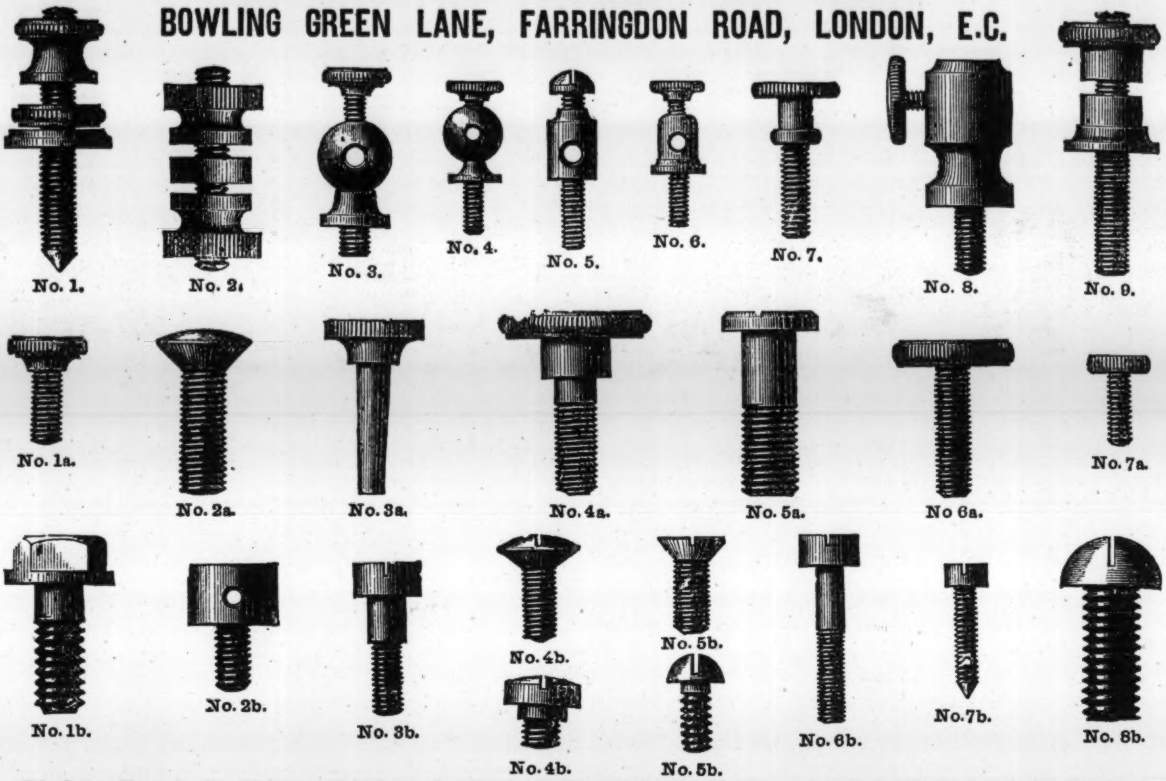
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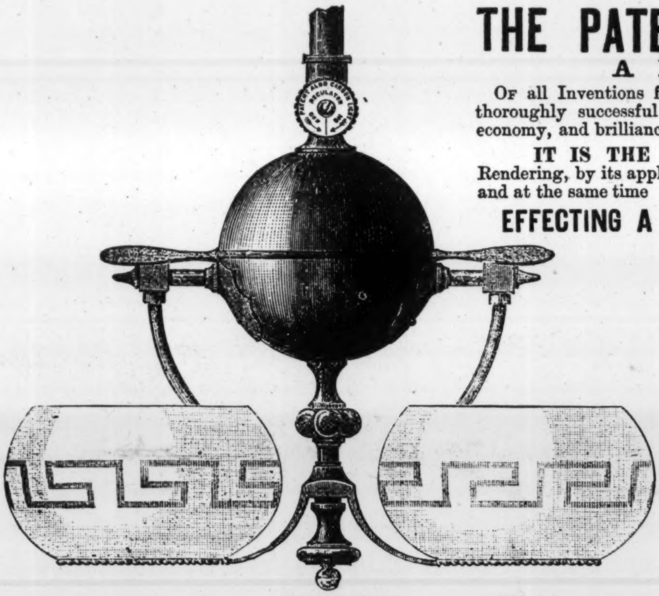

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